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ARCHEOLOGICAL STUDIES

AMONG THE ANCIENT

CITIES OF MEXICO

BY 82363

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PART II, MONUMENTS OF CHIAPAS, OAXACA AND THE VALLEY OF MEXICO.

CHICAGO, U. S. A.

February, 1897.

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PART II.

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PREFATORY NOTE.

The short period intervening between the publication of the first part of this paper and the completion of the part now issued, has witnessed much activity in the exploration and study of Mexican and Central American antiquities, and numerous publications, treating of the subject in one or another of its phases, have appeared. Seler has added an important work on the mural paintings of Mitla; Maler has described several heretofore little known ruins of Yucatan; Mercer has published a valuable study of the Yucatec cave formations; Le Plongeon has gotten out his long delayed book on Maya remains; Maudslay has issued an excellent work on Chichen-Itza; and the Peabody Museum has sent out a handsome volume on the ruins of Copan. Some of these publications relate to the territory covered by the present study, but their contents are not of such a nature as to make necessary any change in this sketch as originally planned.

I am much indebted to numerous friends for commendation and criticism of Part I of this work. Mr. Maudslay has called attention (Nature, July, 1896) to the fact that the serpent columns of Chichen-Itza terminate above in the rattles of the rattlesnake, as I had surmised, but that instead of projecting horizontally, the tail is turned upward at the tip, standing free of the entablature. It happens that this form is correctly shown in the fallen capstone, Fig. 40 of Part I of this paper. I have already made this correction in a cut published with some notes in the American Antiquarian for June, 1896. Mr. Maudslay points out that the statement made on page 102 of Part I, to the effect that the Mayas held possession of Chichen-Itza for two hundred years after the conquest, seems to require explanation. This statement was intended to refer to Uxmal and to express the idea that this place, along with the territory in which it stands, was not fully taken possession of by the Spaniards for about that length of time.

Mr. Maudslay has in preparation a very elaborate work on the ruins of Palenque, and has had the kindness to forward for my use his excellent map of the city, beside numerous plans and sections. I have, however, not made use of these to any great extent, as my sketches, made on the spot, serve all purposes in the presentation of this brief account. I had not fully realized our great indebtedness

to Mr. Maudslay in our explorations until I learned through a letter from him that the cutting down of the forests and the uncovering of many of the ruins were due to his enterprise.

The contemplated final chapter on the origin and development of ancient Mexican architecture will take the form of a separate publication, as it is too voluminous for insertion here. In its place, however, I have added a short chapter on Mexican sculpture, illustrated by a few specimens of special interest. Although these pieces have been presented to the Museum by Mr. Armour, and are thus appropriately described in this work, they were not secured by him in Mexico, but obtained from private owners in this country. It has not been attempted, either by Mr. Armour or the Museum, to import any important object of antiquity from Mexico, but such examples as have come within reach have been secured and cared for, and I am fortunate in being able to publish some of these for the benefit of students.

Delay in the issue of this publication is the result of pressure of Museum duties and the extremely tedious work of preparing the numerous drawings.

RUINS OF CHIAPAS.

PALENQUE.

INTRODUCTORY. The voyage from Progreso, Yucatan, to Laguna or Carmen, in Campeche, and the journey thence by land and water to Santo Domingo del Palenque, have already been sketched in the itinerary, Part I, and need not be elaborated here. The distance traversed was some 500 miles, much the larger part of which was by sea. The trip inland from Carmen was exceedingly interesting and refreshing, the country affording a most grateful contrast with the monotonous landscape of the peninsula. The ancient cities of Yucatan are situated in the midst of forest covered, yet arid, plains, and owe all they have of striking or picturesque effect to the vast systems of artificial terraces and pyramids upon which they are built, but Palenque is set back against the steep slopes of the Tumbala foothills, and is buried in luxuriant forests through which descend throughout the entire season (save when swollen by heavy rains) limpid and refreshing mountain streams. To the mystery and grandeur of the ruined monuments are added the peculiar charms of tropical environment, and a visit to Palenque is like a glimpse into fairyland.

Approaching the ruins of Palenque from the village of Santo Domingo del Palenque, some eight miles away, following obscure trails over the low forest-clad foot-hills, we reached a small stream called the Rio Michol, and a little farther on crossed a small western tributary called the Otolum, which descends from the highland through the ruined city. Following the left bank of this stream we ascended several hundreds of feet by steep stages, encountering terraces, fallen walls and scattering masses of architectural debris at every turn. At the left could be heard coming up from far below, the music of cascades echoing and re-echoing through the deep forest. Finally we came to a halt against a steep slope, densely covered with young forest, which proved to be the northeast corner of the pyramid of the great ruin called the Palace. We left our horses in charge of the Indian packers, and climbing the rocky terrace, entered the build-

ing and, as others had done before us, took up our residence in the corridors separating the two great courts. Having thus established ourselves, we began at once the difficult task of locating the various buildings now almost wholly hidden by the rank young forest growth which has sprung up in the few years since clearings were made by former explorers, A. P. Maudslay probably being the latest. The area occupied by the principal monuments is comparatively small, and is confined to the sides of the narrow gorge of the Otolum at the point of its emergence from the mountains. Little idea could be obtained of the general appearance of the remains, for only their summits appeared above the foliage, and all that could be seen of the surrounding landscape were the wooded spurs, several hundreds of feet high, that overlook the city, and the forest covered slopes below fading out in the great plain to the north.

The exploration of Palenque is as yet hardly begun, as detailed observations and records, even of the most superficial phenomena, have not extended beyond a few of the better preserved structures. It is impossible to say, therefore, what will yet be unearthed from these ruins and the many others said to be scattered through the almost impenetrable forest.

Of the builders of Palenque little definite knowledge has been obtained. History seems to furnish absolutely nothing, but archeology enables us to say that the people were probably of the Maya stock and intimately related with other better known Maya groups.

The literature of Palenque is already quite voluminous, the works of Del Rio, Dupaix, Waldeck, Stephens and Charnay affording an interesting and valuable body of information, and the compilations of Kingsborough, Rau and Bancroft doing much to bring order out of chaos. Morlet, Brine and others have sketched interesting visits, and Mr. A. P. Maudslay has in preparation a systematic study, which may be counted upon to furnish the most thorough and scientific presentation of the subject yet made. My own work here was limited to four days only, and though this time was utilized to its fullest extent, I was not able to explore and study more than a few of the principal ruins, and no attempt at monographic treatment of the group will be attempted. Observations will be made upon the more interesting features and characteristics of the buildings visited, and the descriptive matter will be presented with the panoramic view as a basis.

The situation of the city is remote from thoroughfares of travel and many miles distant from any settlement that can afford the conveniences and facilities necessary to the tourist or explorer, and the site has, therefore, had an exceptionally small number of visitors. It is some

eighty miles south of Carmen, on the Gulf coast, thirty miles from the Usumacinta river, and lodged against the northern base of the mountain ranges that border on Guatemala. A small sketch map is here inserted, Fig. 42, to indicate its general position.

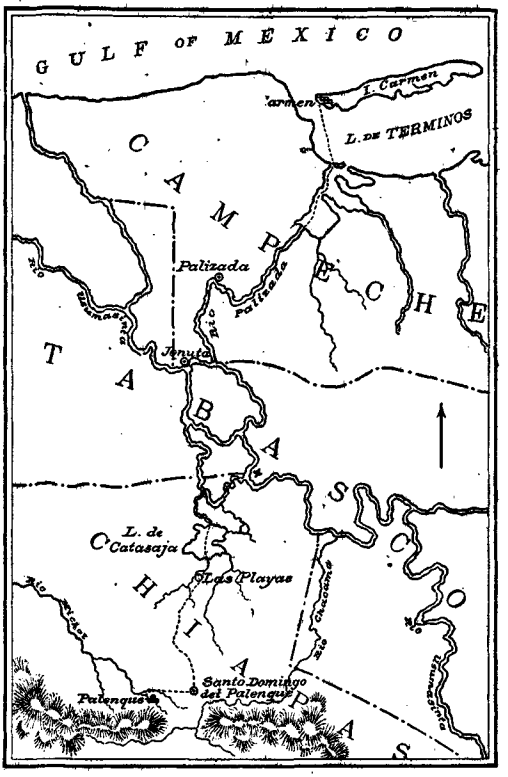


FIG. 42. SKETCH MAP LOCATING PALENQUE.

The journey from Carmen was by way of the Palizada and Usumacinta rivers to the Chiapas boundary at the point marked by a cross (x); thence southwest by the most direct waterways to Catasaja lagoon. Scale about 25 miles to the inch.

PANORAMIC VIEW. Our attention during the four days spent here was given almost wholly to the Palace and the five principal temples which rise above it against the hillsides, and these buildings are about all that can be made to appear in the panorama, which has been rather hastily drawn, though carefully worked out as to position of the monuments and general effects of the group. The point of view was of necessity assumed, and is a little to the north of the Palace, as indicated on the accompanying sketch map, and at a level about equal to that of the top of the Temple of the Cross, a hundred

feet at least above the roof of the Palace. We are thus looking almost directly up the forest-clad gorge of the Otolum and have our backs toward the far-reaching plain. Beneath our point of view and back of it, on the slope, are other ruins of buildings, walls and terraces, to include which would reduce the effectiveness of the main features of the view. The omission of the forest was absolutely necessary to the display of the ruins, and conventionalized foliage has been employed to assist in bringing out the poorly defined forms and in obscuring parts of which nothing definite is known. It should be kept in mind that in the actual view nothing would be seen, even from the point of view assumed, but a few slight bits of the crests of ruins and a glimpse perhaps into the principal court of the Palace, which has been kept clear of young trees from year to year by casual visitors.

The Palace, A, is seen at the right in the foreground; beyond rises the lofty Temple of the Inscriptions, B; and farther up the stream, set in against the hillside, is the Temple of the Beau Relief, C. At the left, across the gorge, are three buildings crowning as many pyramids; the first at the left is the Temple of the Cross, D, seen from the back; the second, to the right, is the Temple of the Sun, E, also seen from the back; and between these and a little farther away is the Temple of the Cerro, or Cross No. 2 of Charnay, F. In the immediate foreground may be detected the arched opening, G, of the mysterious waterway through which the Otolum passes for several hundred feet.

ORIENTATION AND ASSEMBLAGE. The placement of the buildings of Palenque would seem to be due more to the position and trend of the natural features of the site than to any regard for the points of the compass, though there is recognizable a general tendency to conform to these points. The walls of the Palace vary from 5 to 15 degrees from the magnetic meridian and agree in the main with the course of the stream and its banks. The Temple of the Beau Relief is a little nearer exact in its orientation, but is also in harmony with the topography. The others vary from 20 to 45 degrees from the magnetic placement. Of the principal temples one faces north, two face east, one faces south and one west (all approximately), and have thus slight suggestion of uniform relations with the valley or stream, or with the grand pile of the Palace which takes a central position with respect to the whole group of remains. The assemblage throughout is, therefore, somewhat incoherent, convenience of proximity and adaptation to topography having doubtless largely governed the placement.

One of the most noteworthy features of the group of remains is the elaborate system of terraces bordering the stream and leveling up the irregular features of the topography, even extending in a large measure to the neighboring hills. Their trend was regulated partly by the topography of the site and partly, it would seem, by a desire of the builders to conform to the points of the compass.

MATERIALS AND MASONRY. As with the Yucatec cities, there is here an abundant supply of limestone—the only available building rock in the districts visited by our party—but it is harder and less even in texture than the limestone of the north, and is often very refractory. It was, therefore, not used extensively for cutting and carving, but was broken up into portable masses and laid in mortar with natural or rough trimmed faces, and the surfaces were plastered and decorated in stucco-work or color. The walls of the tower afford a good example of this class of work, the stones used being small and heterogeneous in shape. The laying of regular courses of hewn stone was rare in the building of walls; large stones were often used where particular stress was expected or where true, firm angles were desired, as about doorways and openings, in cornices, ceilings, piers, arch-caps, roof-combs, etc., but even these are seldom well dressed as their surfaces were rarely intended to be exposed to view, every part, even the smoothest, receiving coatings of plaster or washes of color. Inner stairways employed large, well-squared stones, and numerous large slabs were required in the making of tablets, which were covered with inscriptions and figure subjects in low relief and set in plaster against the walls of temples, or in sloping positions around the courts, forming no essential part of the constructive work.

No quarries have been located, and it is not probable that well marked examples exist, as the getting out of large masses of stone was exceptional and the bulk of the masonry was made up largely of loose surface material.

Vast bodies of mortar were used in the walls and hearting, as well as in stucco work. Although it has been suggested by some writer that the lime was probably obtained by collecting and burning small land-shells, which abound in this region, it seems to me much more reasonable to suppose that lime was burned from limestone, as must have been the case in other sections where mollusks do not abound.

So far as I am able to determine, there was here, as in Yucatan, little admixture of sand with the lime. The term *mortar* serves to designate the whole range of mixtures used in masonry, stucco modeling and surface finish, without reference to composition. Lime is

everywhere the chief ingredient, though sand has been used in some cases as well as coarser materials, the latter having been added wherever floors, pavements and roofs were to be laid. Specimens of white, fine grained mortar brought home from Cozumel, Uxmal and Palenque have been examined by Professor O. C. Farrington, and the following statement is furnished by him. It is to be noted that the specimens submitted to him are of the finer, purer varieties and do not represent the full range of mortars. Professor Farrington's notes are as follows:

"The specimens of ancient Mexican mortar submitted to me for examination were for convenience numbered 1, 2, 3 and 4.

"No. 1, from Palenque, was white in color, porous, fairly tough, amorphous and homogeneous in texture except for a small quartz pebble which it included.

"No. 2, from Palenque, was of similar color and texture but very tough and compact.

"No. 3, from Cozumel, was yellowish-white, porous, friable and granular, and contained lumps of pure white, more compact material.

"No. 4, from Uxmal, was similar to No. 3 in color, tenacity and texture, but contained also harder and darker grains.

"Fragments of the specimens were first treated with hydrochloric acid in order to determine whether sand or clay, or any substance other than lime or limestone, had been used in making the mortar. All, however, were completely dissolved without residue (except No. 4, which gave a slight, flocculent residue of silica evidently not derived from the addition of a foreign substance), and therefore must be considered as wholly made up of limestone.

"The next point of inquiry was as to whether lime had been used in the making of the mortar as is the modern practice. The specimens were tested for free lime by digesting twelve hours in cold water. The solution then gave an alkaline reaction and a slight precipitate of calcium carbonate with sodium carbonate. These tests, though indicating that lime was present, were not sufficiently decisive to prove it. If lime were used in making the mortar it is a question whether it would not by this time be all converted to carbonate by its long exposure. In this case no chemical test would show any distinction. The only difference, then, to be detected between lime and powdered limestone, as used in the mortar, would be one of texture. That lime was used I believe to be indicated by the compact texture of Nos. 1 and 2, and the whiter lumps scattered through Nos. 3 and 4. The texture and compactness of these is such that they can hardly have been formed from anything else than lime.

"On grinding some of the limestone of the region, mixing it with water and allowing it to dry, it was found to set to quite a firm mass. It is probable, therefore, as the appearance of Nos. 3 and 4 indicate, that material of this character was mixed with lime for making the mortar. I believe, however, mortar such as Nos. 1 and 2 to have been made wholly from lime, which was probably obtained by burning the limestone of the region."

Wood was extensively used for lintels, but, strange to say, no specimen has been preserved. This latter fact is used as an argument for great age by some writers, but in considering this point we must keep in mind two facts; first, that Palenque is situated in a more than usually moist district, and the prevalent moisture must have contributed to hasten decay, and second, we cannot be sure that the wood employed by these builders was the very durable zapote and not some local variety yielding more readily to decay. That wood was much used is demonstrated by the presence of hundreds of vacant lintel spaces, some of which show plaster impressions of the general shape of the beam if not of the peculiar characters of the woody surface. At least three hundred lintels were used in the Palace alone. The removal and replacement of these beams, as they became weakened by decay, must have been a great burden to the builders, and it seems a wonder that the offset arch was not more fully adopted for openings, exterior as well as interior. The use of wood was the great element of weakness in these buildings, leading to the destruction or partial breaking down of every façade in Palenque.

CONSTRUCTION. The constructive characteristics of these buildings have been referred to in the introductory pages (Part I), where a number of illustrations were given which served to indicate the many analogies and the numerous and striking differences in the buildings of the two provinces. A brief review of the principal features of the Palenque constructions may be introduced in this place.

SUBSTRUCTURES. The substructures must receive brief attention. In the better known cluster of ruins there are upward of a dozen important pyramids of greatly varying style and dimensions, eight only retaining considerable or extensive remains of their superstructures. Of the latter the panorama shows the Palace, the Temple of the Inscriptions, the Temple of the Beau Relief, the Temple of the Sun, the Temple of the Cross and the Temple of the Cerro or Cross No. 2. It is difficult to secure a definite knowledge of the original appearance of these mounds, as they are very much broken down, forming conical heaps, or are obscured by debris or vegetation. Some are built on approximately level ground and are symmetrical

in outline, while others are set against the mountain sides, taking the character of terraces. The slopes are steep—reaching 45 degrees or more—and it is evident that all, or nearly all, were faced with hewn stone or finished in plaster. Some were terraced, and the Palace had the slightly sloping faces of the successive steps paneled or coffered—in part at least—in hewn stone, something as in the pyramid of El Castillo at Chichen-Itza. The greatest height is about 80 feet.

Much diversity of opinion has been expressed with respect to the stairways by means of which the pyramids were ascended. It seems reasonable that a building having a single entrance should be approached by a single stairway, but Stephens and others seem to convey the idea that some of the temple pyramids have, or had, stairs on all sides and covering the entire surface. That such is or ever was the case I am inclined to seriously question. It is to be expected, however, that if the building has doorways on all sides there will be stairways to correspond; and I am of the opinion that one or more flights will be found to have existed for each front of the broad compound terrace of the Palace. Most of the stairways exposed to view at the present time are short interior flights built of hewn stone, though a few are of rough masonry and were probably finished in plaster.

It appears that the ancient builders did very extensive remodeling of the original topographic forms adjoining their structures, and the terraces, rising from the stream level to the levels upon which the pyramids stand, have been graded and probably faced—as were the pyramids—and furnished with convenient stairways. The surface of nearly the entire area included in my map, Pl. XXIV, besides much beyond its limits, has been remodeled by human hands.

As to the composition of the interior mass or hearting of the pyramids, I could form little idea, save from the appearance of the debris in cases where there were breaches not entirely hidden by the omnipresent vegetation. There can be little doubt, however, that, as in Yucatan, it consists of heterogeneous bodies of earth and stones, with mortar where it was most needed. It would appear that often, if not generally, the construction was first carried up with vertical walls and that abutting masonry was afterwards added, forming a slope corresponding to that adopted for the stairways. The platform floors were as a rule finished in cement or concrete, but slabs of limestone were used to a limited extent.

SUPERSTRUCTURES—GROUND PLAN. The buildings of Palenque, so far as preserved, occupy nearly the entire area of the platforms of the substructures, and I saw no esplanade having a width of more than

six or eight feet; generally it is less than three feet. In the temples the ground plan is extremely simple and uniform, but it is quite complex in the one great structure, or group of structures, called the Palace. The buildings consist, in most cases, of vaults, constructed very much the same as in Yucatan, arranged in pairs under a roof that slopes from a medial ridge to the eaves at both sides and ends. The temple plans given in Fig. 43 show the front wall, interrupted more or less frequently—one, three or five times—by doorways, and the medial wall separating the two vaults perforated by as many doorways as there are apartments in the back vault. The essentials of the plan are a vestibule occupying the entire front vault and a sanctuary occupying all or part of the back vault. In several cases partition walls divide the inner vault into a sanctuary and two lateral chambers, as seen in *c* and *d*. A most notable feature of the better class of structures is an inner sanctuary or tablet room, which is a small chamber built within the sanctuary and against the back wall, as indicated in *d*.

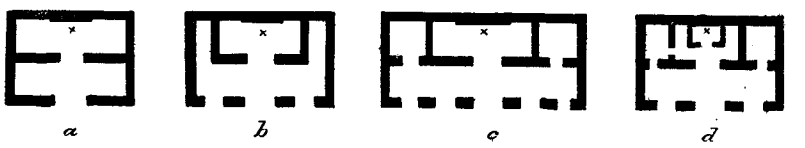


FIG. 43. GROUND PLANS OF TEMPLES SHOWING PROGRESS IN SPECIALIZATION OF FEATURES.

a. The simplest form with vestibule and tablet room entered by single doorways.
b. Triple entrance and special tablet room.
c. Five doorways and a tablet room with lateral chambers.
d. Addition of an inner sanctuary intended to still further seclude the sacred tablet.
The tablet in each case is placed against the back wall at X.

The great cluster of buildings called the Palace, (see panorama), consists for the most part of a remarkable aggregation of the double vault units which vary in length and arrangement of apartments as indicated somewhat closely on the map, and in Fig. 49. In the lower-level building, at the south end, three long east and west vaults are placed side by side. There seem originally to have been few partitions in the open or corridor-like vaults of the exterior as well as most of the interior ranges, though thin walls have been added in some cases.

The Tower is unique in many of its features. It has been described as "a tower within a tower," but this indicates a misconception as it is rather to be regarded as a building with a single square enclosure or room on each floor, upward through the center of which a stairway has been built, the so-called inner tower being only the

masonry column necessary to support and contain the stairway. The plan, Fig. 44, A, is somewhat analogous to that of the round tower of Chichen, Fig. 44, B, where there is a cylindrical central column containing the stairs.

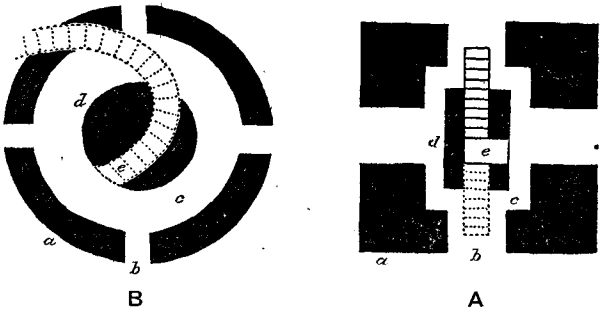


FIG. 44. GROUND PLANS OF ROUND AND SQUARE TOWERS COMPARED.

a. Four sections of walls.
b. Four doorways.
c. Inclosed spaces.
d. Central shafts carrying stairs.
e. Entrances to stairways. The spiral stairway passes up through the central column and over the arch all the way through solid masonry. The other has a flight and landing for each story (Lower flight in solid lines, upper in dotted lines.)

Of course in the Chichen tower we have a second wall added without, not shown here, and the vaults are arched, while in the Palace tower some vaults are arched and others flat, according to the available vertical space.

PROFILE AND CONSTRUCTION. The construction of the Palenque building is well shown in the generalized section, presented in Fig. 45, which should be compared with the section of a Yucatec building given in Fig. 5, Part I, and with the Mitlan building farther on in these pages.

The walls are from 2 to 4 feet thick and rise directly from the pavement with vertical faces to the spring of the arch within and to the eave moldings without—a height varying from 8 to 10 feet. The vault face within has a slope of some 65 or 70 degrees, while the outer surface, instead of rising vertically as in Yucatan, slopes inward at an angle corresponding pretty closely with that of the soffit slope within. The medial molding of the Yucatec wall becomes the eaves molding of the Palenque building, and at the level of the cap-stone of the arch there is exteriorly a second line of moldings, corresponding to the cornice molding or coping of the Yucatec structures; and above this the roof proper has a much reduced pitch, giving the effect of a mansard roof. The vault within never exceeds 10 feet in width,

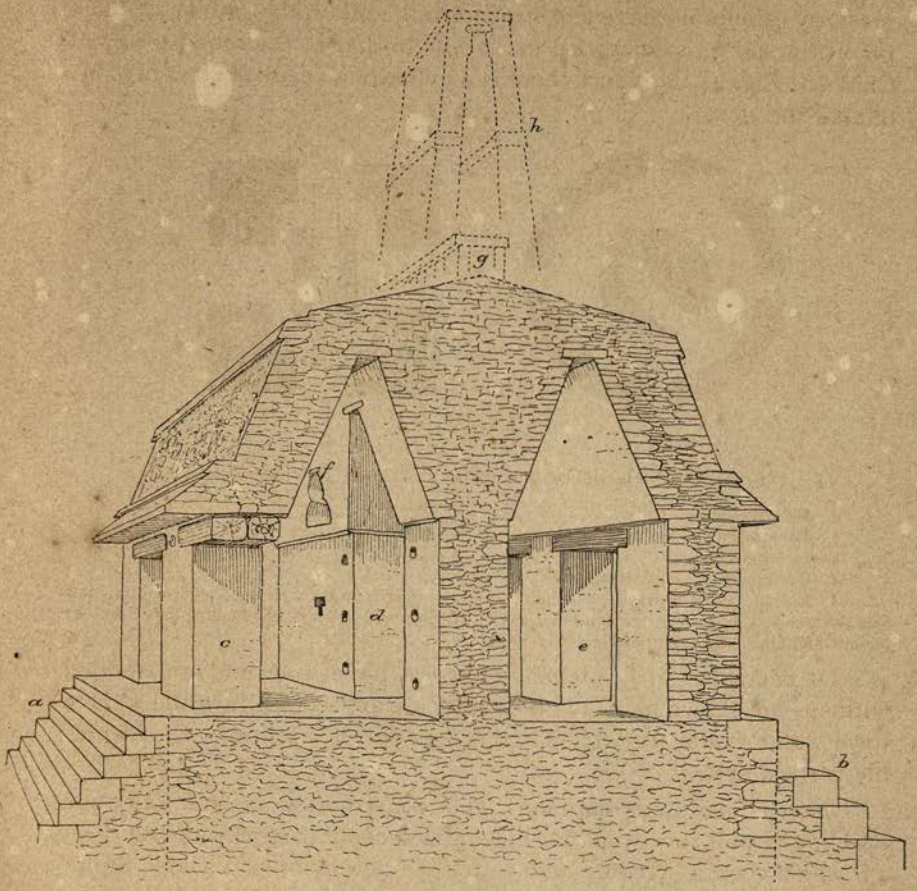


FIG. 45. TRANSVERSE SECTION (SOMEWHAT GENERALIZED) SHOWING CONSTRUCTION OF PALENQUE BUILDINGS.

a. Outer stairway ascending pyramid.
b. Inner stairway ascending from court; relation of stairways to body of pyramid somewhat uncertain (see dotted lines).
c. Pier separating doorways; section of wooden lintels (restored) above.
d. Doorway through medial wall connecting corridors; cord holders at sides.
e. Inner pier and doorway facing court.
f. Trefoil opening through medial wall.
g, *h*. Two principal varieties of roof-comb.
Projecting eaves and sloping, decorated roof.

but the height in the larger buildings is often 18 feet or more. The insloping walls of the arch are connected above by slabs of limestone, as in Yucatan. In one or two cases in Palenque the entablature zone (as defined in Part I) is vertical or nearly so, and the roof proper is

nearly flat, thus seeming to suggest a transition from the flat to the pitched roof. Charnay believes that the difference between the Yucatec and southern roof may be accounted for by the difference in climate between the two sections. Chiapas has a prolonged wet season, with exceedingly heavy rains, and a steep roof would become a necessity; while Yucatan has much less rain and the flat roof was sufficient protection. It may be, however, that the difference in pitch arose independently of climatic influences. When the offset arch developed and took the place of the horizontal beam the several feet of added elevation required changes in exterior profile, and it seems quite as natural that the added exterior surface should slope inward with the slope of the arch forming a watershed, as that it should be carried up vertically as in the Yucatec structures and in certain buildings here in Palenque. Allowing, however, that both forms are independently developed from the horizontal span, it is plain that the sloping form is more likely to have arisen in the wet climate and the vertical wall and flat roof in the dry climate.

The roof-comb is an important feature of these structures, though it is absent in some cases, notably in those having flattish roofs. In the better preserved buildings of the Palace group, and in some of the temples, it appears to consist of a balustrade-like arrangement of stone slabs, as shown in the figure, but in three or four of the temples it becomes a most important and striking feature, as indicated by the dotted lines. In these buildings the roof slopes continue around the ends as well as the sides, so that the comb does not extend the full length of the building, as in Yucatan, being limited to the crest line.

DOORWAYS. The doorways of the Palenque buildings differ considerably in appearance from those of Yucatan, but involve no new principle of construction, the peculiarities being the result of minor differences in form merely.

Exterior doorways are mere rectangular openings in the walls, (Fig. 46), often so numerous that they occupy the larger part of the space, leaving squarish pillars between. They were spanned by wooden lintels, generally in pairs or threes as indicated by the impressions left in the masonry. The construction is illustrated in the figure which shows also the circular glyphs at the top between the lintels of adjoining doorways, but the handsome reliefs of the pillar faces are omitted.

Inner doorways are sometimes squarish, as are the outer, and were spanned by stone or wood; but in many cases they are arched above, the construction and style varying with the situation.

Fig. 47 shows the effect of carrying the arch upward into the thickening partition or medial wall, and at the left is seen a smaller, side entrance, not reaching up to the spring of the chamber vault. Over this is a window-like opening through the partition wall arched above as are the doorways.

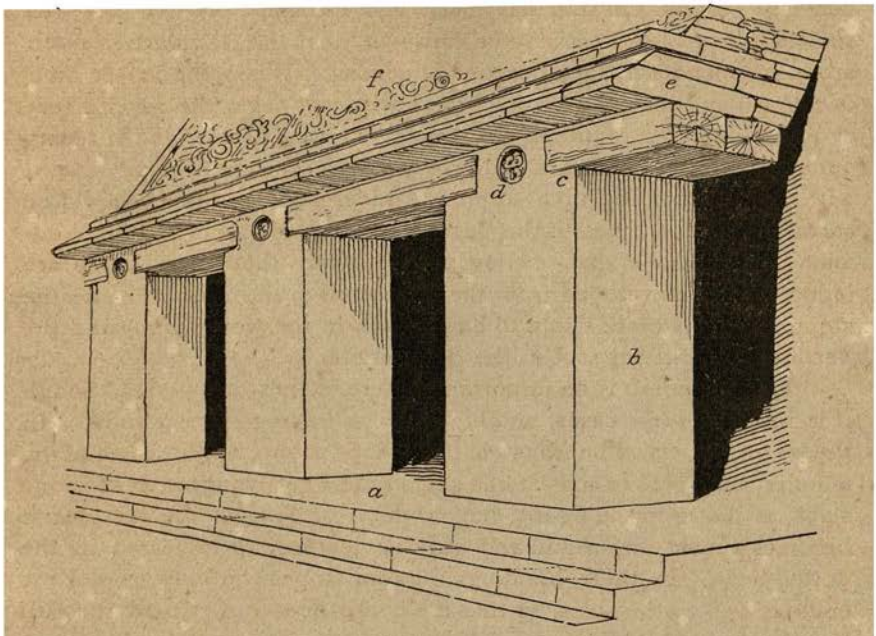


FIG. 46. EXTERIOR DOORWAYS AND PIERS WITH WOODEN LINTELS (RESTORED).

a. Stairway, narrow esplanade and entrance.
b. Masonry piers with stucco finish and decoration (omitted).
c. Wooden lintels restored conformably with sockets.
d. Circular glyph between lintels.
e. Eaves.
f. Sloping roof with stucco decorations.

An ambitious attempt at doorway elaboration is illustrated in Fig. 48. The soffit is constructed with a double curve, which is very graceful and gives a somewhat trefoil effect to the opening.

PILLARS. The specialized column, forming a square or round shaft separating wide entrance ways and supporting the lintel and entablature, is unknown in Palenque, and we find only the flat, squarish pillar, which is merely a section of the normal wall of the building, separating doorways. These pillars occur in pairs or in larger numbers according to the number of the doorways. They are always of masonry finished in plaster, and very generally the exterior surface is embellished with figures in stucco, as shown in Pl. XIX.

In all cases they are marred at the top by the falling of the wooden lintels the ends of which were set into the masonry flush with the front.

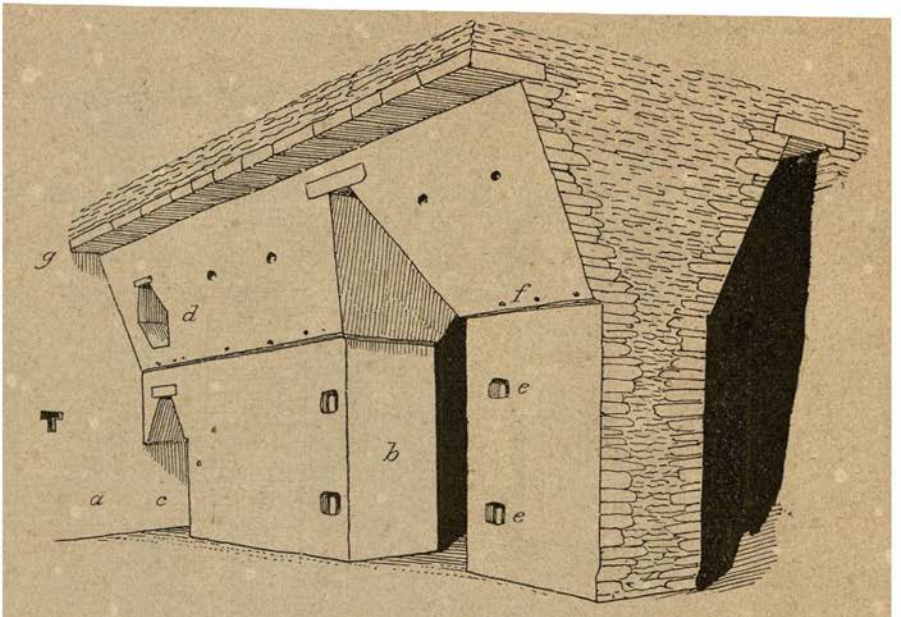


FIG. 47. INTERIOR DOORWAYS (THROUGH MEDIAL WALL) WITH SECTION OF MEDIAL WALL AND CEILING.

a. End wall of vestibule (outer vault).
b. Entrance to sanctuary (rear vault).
c. Entrance to ante-room.
d. Window-like opening through medial wall.
e. Large cord holders at sides of door.
f. Small cord holders in offset of vault.
g. Section of ceiling showing capstones and roof masonry.

SCULPTURE. Although bas-relief sculpture and modeling in stucco were practiced with boldness and much refinement in Palenque, sculpture in the round seems to have been almost unknown. Even the two figures found on the slope of the pyramid of the Cross and described by Stephens* are hardly more than reliefs, as the sides are rounded merely, not sculptured, and the backs are flattish and rough. They are not statuary in the proper sense, but probably served as pier fronts or balustrade embellishments. The material is doubtless the limestone of the vicinity. The example pictured by Stephens is 10½ feet in height, though without the head-dress and tenon-like base the figure is found to be not above 5 or 6 feet. I was not so

* Incidents of Travel in Yucatan, Vol. II, p. 394.

fortunate as to find this specimen, though it is probably, still lying at the base of the Temple of the Cross hidden by the dense undergrowth.

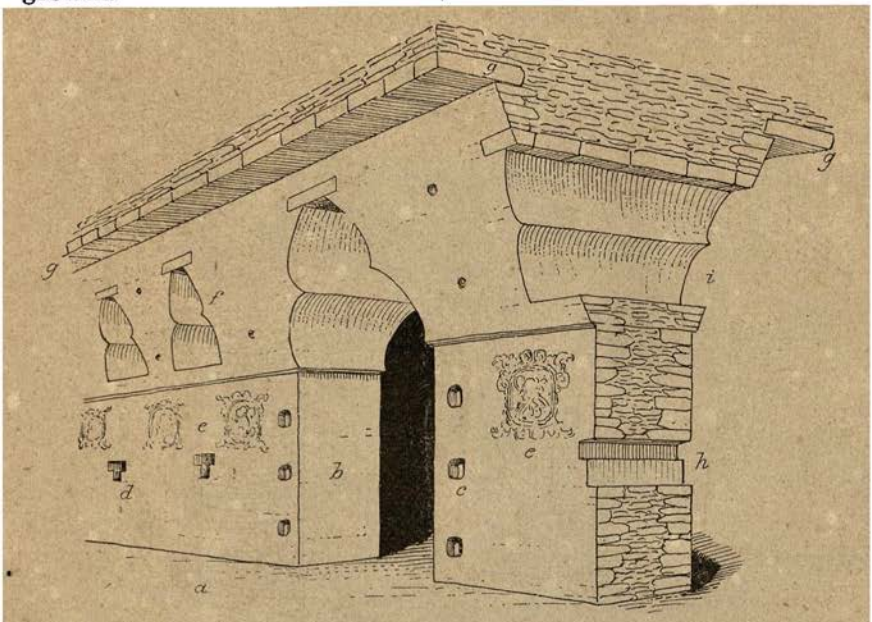


FIG. 48. INTERIOR DOORWAY WITH SECTION OF MEDIAL WALL AND CEILING.

a. Floor of outer corridor.
b. Doorway through medial wall (trefoil arch, modified cuneiform).
c. Cord holders.
d. Tau shaped niches and openings, section at *h*.
e. Stucco reliefs; rococo-like framework inclosing relief busts.
f. Trefoil, window-like openings through medial wall, section at *i*.
g. Section of ceiling stones and roof masonry.

It is a noteworthy fact that mural sculpture, so common in Yucatan, is here replaced almost wholly by stucco modeling, the sacred tablets set in the walls of sanctuaries in the various temples, and a few minor tablets in other situations alone being sculptured. There are six, possibly more of these tablets of large size, and beds are found for six inferior tablets which occupied the narrow faces of the tablet chambers at the sides of the doorways. Two of these, from either the Temple of the Sun (Stephens) or of the Cross (Charnay), have been carried to Santo Domingo where they are set in the walls at the sides of the church door. Illustrations of the latter figures are given by Stephens,* and their place at the sides of the inner doorway is shown by him in an excellent plate facing

*Incidents of Travel, Vol. II, facing page 353.

page 354. In one of the corridors of the Palace I found a small fragment of a thin slab that had been sculptured in the usual style in low relief and painted a bright red. These tablets are all in low relief and the tasteful designs, including human figures, symbols and glyphs, are worked out with a delicacy of relief and a refinement of finish unsurpassed in any equally important work in stone in this country. They are totally distinct in character from anything in Yucatan or the Mexican plateau. In some respects these works do not compare well with Assyrian and Egyptian sculptures representing somewhat kindred subjects, but they are more elaborate, exhibit equal facility and freedom in drawing and certainly embody a more complex and fanciful system of symbolism. In style they are more Oriental than Assyrian or Egyptian.

Aside from the tablets mentioned the most important sculptures are found in the two great courts of the Palace. One group consists of archaic looking figures of men and women occupying the faces of large heavy slabs of limestone set at a steep angle against the temple foundation at the sides of the broad flights of steps within the courts. These seem of the nature of portal guardians as do also the sculptures at the heads of stairways and the relief figures occupying the antæ of the inner sanctuaries of the temples. Their function must have been distinct from that of the tablet sculptures and again from the stucco roof-comb decorations.

STUCCO WORK. The builders of Palenque, so far as the preserved monuments show, were the greatest stucco modelers in America. The Izamals did bold and effective work, as did the builders of Labna and other places, but here modeling in stucco was the chief reliance of the builders in all matters of finish and decoration, interior and exterior; pillars, wall spaces, broad roof slopes and lofty roof-combs were covered with marvelous figures rivaling in elaboration the composite sculptures of Uxmal and Chichen, and exceeding them in freedom of treatment and refinement of style, the seated figure in the Temple of the Beau Relief, if the drawing of Waldeck can be relied upon, being one of the greatest masterpieces of American plastic art. In the Palace and its associated temples there were something like eighty heavy exterior piers, rectangular in section, varying from 3 to 6 or more feet in width, from 6 to 12 feet in height and from 2 to 5 feet in thickness, separating the entrances and supporting the entablatures of the façades; half as many more served the same purpose in the various courts and interior corridors, and a large percentage of these were faced with masterly groups in stucco accompanied by glyphic inscriptions

executed in the same style and bordered by narrow lines of formal patterns similarly treated. The main roof spaces of the buildings were all treated as panels and filled with compositions in bold relief and of remarkable freedom of drawing. They embodied human figures in various attitudes, great heads, grotesque faces and monsters, all strongly modeled, tastefully grouped and surrounded with flowing decorations. The roof-combs, with which most of the buildings were supplied, some large and some small, and erected apparently for the express purpose of giving scope to the genius of the stucco worker, were even more richly embellished and many remains of the subjects still cling, after the lapse of four centuries, to these lofty façades. Few efforts at exterior architectural embellishment in any land have been more boldly conceived. Imagine florid compositions worked out in strong relief, filling the roof-combs of the temples 50 to 100 feet above any possible point of view; and beneath these broad sloping roof zones similarly treated, followed again by rows of wide pier fronts faced with handsome figures surrounded by glyphs; and below this still, set against the pyramid or bordering the stairways other equally elaborate works, the whole finished in varied and brilliant color. Let those who wish to secure a more complete notion of the character and rank of this work examine, in connection with the foregoing remarks, the examples represented imperfectly as to relief, freedom of drawing, color and suggestion of size, in Stephens' Travels, Vol. II, opposite pages 339 and 344, and in Charnay's Cities of the New World, facing page 236 and on page 457; the latter from Lorillard town suggesting more fully perhaps than any other illustration so far given the exuberance of fancy characterizing these strange symbol-loving people. The best illustrations to be obtained of the meager remnants of these stucco masterpieces of the Palenque temple roofs are a set of superb photographs made by Mr. Alfred Maudslay of London, an example of which appears in Pl. XXI. It is a source of much regret that all of these works show signs of rapidly advancing decay.

COLOR. Color was lavishly used by the people of Palenque and there is no reason to doubt that it was tastefully used in both symbolic and purely æsthetic applications. Black, white, blue, two reds, yellow and green are seen, the scale corresponding very closely with that used elsewhere in Mexico and in Central America.

The plaster and stucco used were white, and some walls, ceilings and other surfaces were allowed to stand in the plain color, but as a rule not only the show spaces but often obscure surfaces were carefully tinted, and the outside walls and even the roofs and roof-combs

were finished in color. As weathering, decay or use injured the colored surfaces other applications were made, and it is not uncommon to find in broken edges six or more successive coats, more or less deeply buried by renewed applications of plaster or washes of plain color. Color was used also in decorating the walls with various designs, geometric, graphic and glyphic, and numerous traces are still seen in protected places. The most elaborate and showy work was in the painting of stucco reliefs, including figures, groups of figures, symbols, etc., with which many parts of the buildings were embellished. The colors as they stand to-day are often bright and pleasing, and it is a most remarkable fact that on surfaces fully exposed to the elements and to the destructive agencies of vegetable and animal life for 400 years or more, these tints are still well preserved.

The employment of colors in painting the relief groups was no doubt highly conventional, and regulated perhaps by symbolic rather than by æsthetic canons; it is observed, however, that, as a rule, the flesh tones are red or reddish, a rather pale tint prevailing, while costumes, symbolic devices and ornaments employed the whole native palette. Of the nature and composition of the colors little can be made out with certainty, though most of them are no doubt of mineral origin. The sienna red used so generally in all Maya and Nahuatl countries is said to be of vegetable origin, being obtained by steeping a red wood which is found throughout the Mexican and Central American States.

IMPLEMENTS. As to the implements and devices employed in these embellishing arts little has been learned. Stone tools were no doubt used by the sculptor, simple modeling tools of wood or bone by the stucco worker, and brushes of hair or vegetable fiber by the painter. The only implement I had the good fortune to secure was an agate blade—a knife or a lance head—three inches long and one and a half wide. It was found in the Temple of the Sun, and was so coated with calcareous deposit as to seem merely an oblong, flattish pebble.

STAIRWAYS. As stair builders the Palenquans were probably superior in some respects to the Yucatecs; they were familiar with effective methods of introducing stairs into interior construction, there being half a dozen examples of such flights. The Tower has two flights, and the stairways leading from the upper-level buildings of the Palace to the southern lower-level vaults have landings and make various turns within the masonry body. Some of the short flights that lead from the courts to the adjoining galleries are of special interest. They

are formed of large stones, on which are sculptured glyphic inscriptions, and at the sides are unique sculptures in bas-relief. Stephens and Charnay have given satisfactory illustrations of these features. So far as I could observe there are no traces of the remarkable serpent balustrades so common in Yucatan, their place being taken by human figures in relief placed in slanting positions.

THE PALACE GROUP. The "Palace," as it is usually called, is a composite structure—a great group of closely associated structures—not surpassed in interest and importance by any other group of Maya remains north of Guatemala. It is so complex and extensive and withal in parts in such an advanced stage of demolition that the time at my disposal did not permit of a satisfactory exploration. The group undoubtedly represents a long period of growth, the people probably passing meantime through many minor mutations of fortune and art. There appear to be ten or more somewhat independent units of construction (Fig. 49), but the order of their development cannot be made out save in a tentative way. The general consistency of style charaterizing the great exterior ranges of buildings toward the north, taken together with their superior state of preservation, would seem to indicate a later date for them than for the southern members of the group. The addition of these superior buildings and the unifying of the whole group by carrying the galleries and terraces somewhat uniformly along the four sides, appear to indicate also that the greater period of power and culture was toward the close, a period probably ante-dating the conquest by decades rather than by centuries.

This group of remains, as it stands to-day, if denuded in the main of its enveloping foliage, is correctly indicated in the panorama, although I have ventured to bring out certain forms more distinctly than they would appear in a photograph. This is done in cases only where the forms concerned are known. There is no attempt at restoration. The original appearance of the group must have been striking and impressive, and the restoration (after Armin), published by Bancroft* in a small wood cut, though manifestly wrong in numerous details, is still capable of conveying a fairly correct impression to those who keep in mind the general crudeness of Maya work as contrasted with the mature construction and finish characterizing the early temple architecture of Southern Europe, Egypt and the Far East.

THE PYRAMID. The substructure of this group consists of the great platform at the north supporting the principal buildings—in the foreground of the panorama—and a lower terrace at the south,

*Vol. IV, p. 323.

supporting an annexed subordinate structure not seen in the panorama. The main mass varies from 20 to 30 feet in height and measures at the top some 200 feet from east to west, and 225 from north to south. The former measurement is that of the north margin; the south end probably falls 15 or 20 feet short of this. The lower terrace, occupied by the south end building, though poorly defined, is about 40 feet wide and 180 feet long. The original slope of the sides closely approximated 45 degrees.

The site occupied is a somewhat level space, extending back from the west bank of the Otolum. The stream washes (at least at seasons of high water) the southeast corner of the pyramid, but opposite the northeast corner is nearly a hundred feet away, and the channel is depressed to a depth of twenty feet or more. The north and west sides retain their original contour pretty closely, but the east side is broken down and irregular. Here the main slope has been undermined by the powerful torrents of the wet season, and near the middle the abutting masonry has been broken down, exposing what appears to be the vertical wall of the original facing. At the south end also a considerable portion of the nearly vertical facing is exposed, and at the corner the wall rises some twelve feet in two steps, with a sloping rise above to the corner of the main corridor. It is seen here also that the subordinate terrace at the south, some 30 feet long on this side, is set back several feet and faced with a nearly vertical retaining wall. These features are but slightly indicated in the panorama and are barely suggested on the map.

I am able to add little to existing knowledge of the terrace facings and stairways, as nearly everything on the slopes is covered with debris. A principal stairway was probably located on the north, but there were certainly flights on the east and west as well as on the south. It is clear that the north face, to the right and left of the stairway, was terraced, as indicated by Dupaix, and faced in part at least with large, accurately hewn stones, as shown by Charnay. Possibly Maudslay or others have secured additional details of conformation and finish, but such have not come to my notice. It is probable that, as in many cases in Yucatan, the terrace mass is composed largely of earth and stones, and was faced with strong vertical or nearly vertical retaining walls, afterwards covered in by stairways, sloping buttresses and facing. Portions of such a wall are seen on the east front, as already stated; they were exposed by the ravages of torrents, by which agency the stairways and abutting masonry may have been carried away. An examination of the interior of the pyramid would probably bring to light many interesting features in the way of incor-

porated walls, passageways, etc., and show separate stages of growth; the latter are probably in a measure represented by the successive levels of building observed at the south end and in the several courts, and by differences in the style of the buildings.

The ground plan of the group of superstructures—indicated on the map, Pl. XXIV, and in Fig. 49—is exceedingly interesting, and in a general way is well given by Waldeck, Stephens, Dupaix, and in part by Charnay. There is mueh difference in details, but owing to the advanced state of ruin the differences cannot be settled without extensive excavation. Charnay made important observations as to the pronounced assymmetry of the plan at the north end. The position and plan of the southern subordinate building is indicated by Waldeck only.* An analysis of the plan indicates the existence of a number of more or less independent structures, but I am not able to speak with certainty of more than a dozen of these. They are designated by letters in the accompanying skeleton plan, Fig. 49. First we have the north exterior range, A, connected with the east and west wings B and C. Second, the north interior building, D. Third, the south end exterior buildings, E, F, G, H. Fourth, the House of the Mural Tablet, I. Fifth, the House of the Decorated Tau, J. Sixth, the Sanctuary Building, K. Seventh, the Tower, L. Eighth, the imperfectly made out structure, M; and ninth, the subjacent building, N. In addition there are numerous remnants of walls within the courts, notably those connected with the Tower and with the structures at the south end of the southwest court. The four principal courts are indicated by the letters, O, P, Q, R. The opening of the waterway is at S, the washout exposing the tunnel is at T, and the upper end where the water sinks is beyond U.

THE BUILDINGS, A TO M. It is not my intention to try to describe all the buildings with any degree of minuteness, though my notes are voluminous, but I shall sketch them briefly, keeping the panorama always in view.

These buildings, largely separate in construction and varying considerably in height and profile, were in many cases knitted together by connecting structures or masonry (omitted from the plan for the sake of clearness) making the group, in a large sense, a unit. The exterior ranges were, in this way, rendered practically continuous, and perhaps entirely so so far as the exterior lines of pillars are concerned.

As seen to-day this wonderful pile of structures presents a most dilapidated and pitiful appearance. Five or six buildings only have

*The recent surveys of Maudslay are far more complete than any that have gone before. I have utilized his work to a slight extent in the preparation of Fig. 49.

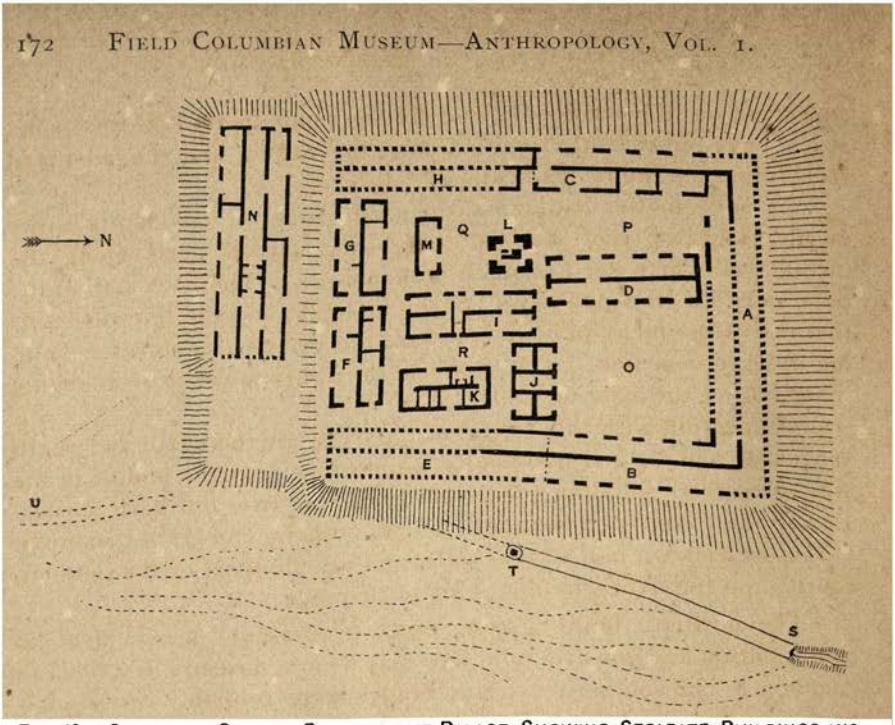


FIG. 49. SKELETON GROUND-PLAN OF THE PALACE, SHOWING SEPARATE BUILDINGS AND COURTS.

Minor connecting walls and additions are omitted for the sake of clearness.

A. North range; in an advanced state of ruin and apparently connecting fully with B and C—well preserved sections of the east and west ranges.
D. North interior building; well preserved.
E. Southern half of east range; in advanced state of ruin.
F. Eastern half of south range; well preserved.
G. Western half of south range; well preserved.
H. Southern half of west range; advanced state of ruin.
I. Building of the Mural Tablet; well preserved.
J. Building of the Decorated Tau; well preserved.
K. Building of the Sanctuary; moderate state of preservation.
L. The Tower; well preserved.
M. Small building in southwest court.
N. Subjacent structure with triple vault.
O. Great court (northeast).
P. Northwest court.
Q. Southwest court.
R. Southeast court.
S. Opening at lower end of waterway.
T. Washed opening into waterway.
U. Point near which water sinks into obstructed entrance to waterway.
Heavy dotted lines indicate obscured walls.
Light dotted lines indicate flood channels.

their roofs largely intact, and these, together with portions of the north ranges and the Tower, are all that do not present the appearance of mere heaps of debris. Of the original exterior range of pillars, upwards of forty in number, none are visible on the north side; five stand on the east front to their full height; seven or eight are partially

preserved on the south side, and six are complete on the west side. A few have but recently tumbled down the slopes, and the stumps of many more are hidden by heaps of debris.

As seen in the panorama, the north range, A, has lost its entire façade, and the roof also is gone, save narrow parts along the medial wall which itself is much broken down. The back wall of the outer corridor (the medial wall of the building) and the line of debris that marks the many pillared front are the principal features remaining to be represented. The profile at the right shows the overhanging inner wall of the exterior vault.

Connecting with this range, at the ends, are the north and south ranges, B and C, and practically connecting near the middle is the well preserved building, D, separating the two northern courts. Facing these courts on the south side are other members of the group, I, J, L, well shown in the view. Beyond are glimpses of the southern courts, and the debris-hidden ruins of that side.

The northern buildings, A, B, C, D, present nearly identical conformation and construction, and may be in a measure described in common. The southern exterior ranges were probably very similar in their principal features and no attempt to analyze them will be necessary. All consist of twin vaults of usual construction, as shown in the sections, Figs. 45 and 50. The width of the vault is from 7 to 8 feet and the height from 15 to 20 feet. The exterior vault—seen in part in the panorama near the northeast corner of the building—appears to have been almost continuous all the way around and was entered by upwards of forty wide doorways separated by pillars somewhat narrower than the openings, save at the corners and perhaps in one or two other exceptional cases. The medial wall separating the vaults had but few openings, two of which are perfectly preserved, one in the east building and one in the west, as shown on the plan. A similar doorway opens through the medial wall of the north interior building. I could detect no trace of a passage through the much ruined northern medial wall, and none of the plans published indicate such a feature, but the advanced state of ruin prevents satisfactory examination. The earlier published plans show several openings, of varied position and character, on the south side. In the northern ranges the inner walls facing the courts are perforated by doorways, in the same manner as the outer walls, and both exterior walls of the interior building, D, are likewise pierced, so that there are no chambers or closed spaces, though at some period of the occupation thin partitions have been built at various points, connecting the pillars with the medial wall; these are now mostly

demolished. The vaults thus take the character of corridors, open everywhere to the sun and air, and are separated by the almost continuous medial wall.

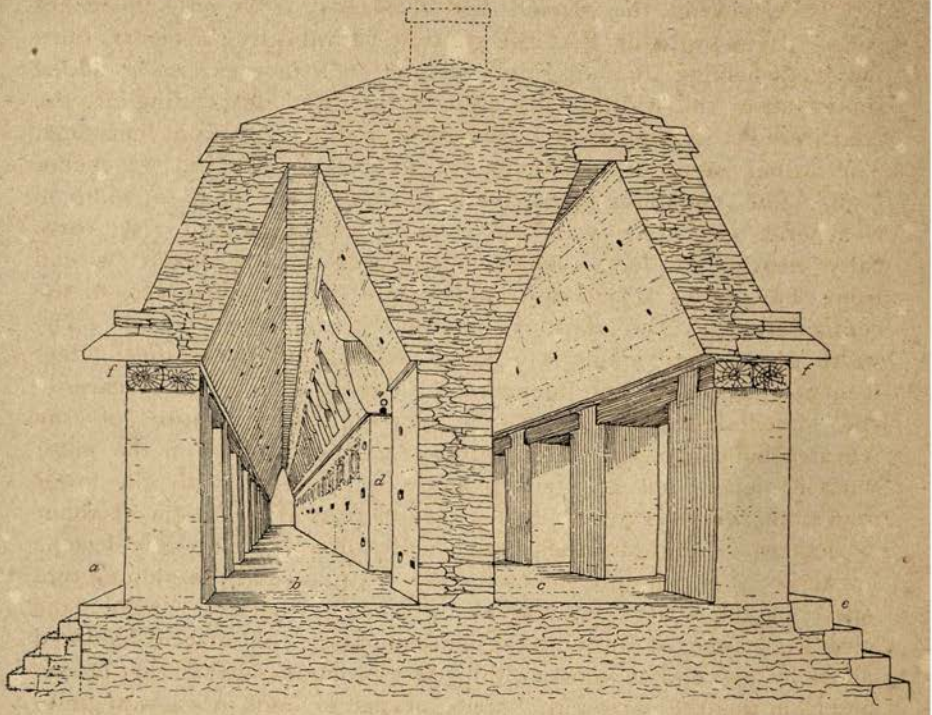


FIG. 50. SECTION AND PERSPECTIVE OF THE EASTERN RANGE (B) OF THE PALACE, SHOWING CONSTRUCTION AND CONTINUING PERSPECTIVE OF OUTER CORRIDOR.

a. Eastern front; stairway restored.
b. Outer corridor; lintels restored.
c. Inner corridor; lintels restored.
d. Doorway with trefoil arch through medial wall.
e. Stairs, descending to court.
f.-f. Sections of lintels (restored) and eaves.
The roof-comb is too much broken down to be analyzed.

The accompanying sketch, Fig. 50, gives a sectional view of the two corridors looking south from a point near the north end of building B. It shows the eastern or outer corridor on the left—the perspective being prolonged to suggest something of the original effect; and the inner corridor on the right, seen at such an angle as to give a good idea of the piers and doorways and the manner of inserting the lintel beams. A brief description in connection with this illustration will convey a sufficiently full and definite notion of the appear-

ance and character of the vaulted galleries of Palenque. The floor is level and well cemented and is 27 or 28 feet in width. The space outside the walls—the esplanade—is very narrow, and at the left, overlooking the stream bed (bridged), it is only 26 inches wide. It is probable that the stairway and abutting masonry, (now removed leaving the original vertical wall face exposed), added somewhat to the width. The steps at the right, descending into the court, are six in number and are built of well cut blocks of limestone. The upper step, or esplanade, is 26 inches wide and 12 inches high. The remaining steps average about 18 inches in width of tread and rise. The walls are about 3 feet thick and rise vertically nearly 10 feet. The soffit slopes of the vault ascend from the narrow offset at a high angle (some 70 degrees) to the ceiling stones. The vault is between 19 and 20 feet high. The width of the outer vault is 7 feet 3 inches, and of the inner 7 feet 6 inches at the points measured. The strongly marked eaves—the "medial molding," as the corresponding feature of the Yucatec buildings was called—project 24 inches, and on the outer surface slope back at a sharp angle to connect with the lower roof slope, which is some 6 feet wide and rises at an angle of about 70 degrees. The roof slopes were usually filled with elaborate designs in stucco, of which only traces remain. A glance at the sloping roof space of the inner building, as given by Charnay,* will make clear the manner of applying these ornaments. This space is bordered above by a second angular molding, less pronounced than that below, and from this the narrow roof-space proper extends at a low angle to the base of the roof-comb. This latter feature is in an advanced state of ruin, but enough remains to show that it probably consisted of a balustrade-like line of stone work, as indicated by dotted lines in the section. The masonry consists in the main of rather small stones of irregular shape, embedded in excellent mortar. Large slabs are used in the construction of wall openings and projecting features of the roof. Surfaces not occupied by decorations in relief, are neatly, though not very evenly plastered, and have been colored in white and possibly in other hues. The perspective, rather imperfectly developed, extends the view a considerable distance to suggest the effect when the whole length was standing. At present there are but five piers remaining at the left, while the four at the right, facing the northeast court, are all in place. These piers—mere sections of the walls—are 3 feet thick, about 6 feet wide and 10 feet in height. The doorways are about 9 feet wide and nearly 9 feet in height to the lintel sockets which are now ragged holes in the tops of the piers. I

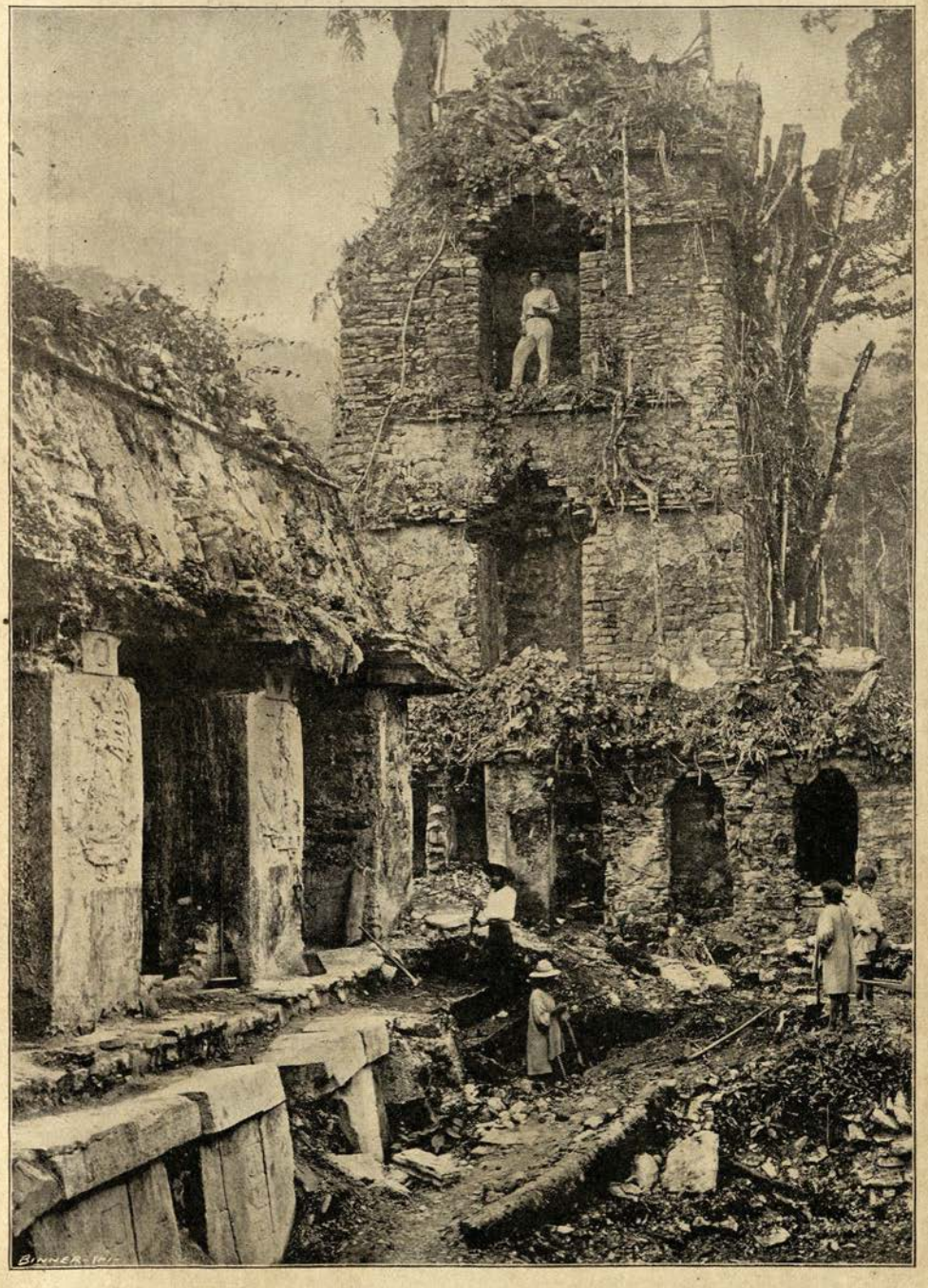
*Ancient cities of the New World, p. 236.

have restored the lintels to indicate their placement more clearly. All have disappeared, but the shape of the beam is in several cases clearly impressed upon the plaster bedding. The over-door masonry is more or less broken out in nearly all cases. The exterior surfaces of the outer piers were occupied by stucco groups in relief, and portions still remain, (see Pl. XIX). The end pillar at the south and probably the corner pillar at the north (now missing) had glyphs instead of figures; and roundish glyphs occur at the top between the lintel ends. This latter statement is true of most of the piers in the group. The inner piers, facing the court, seem to have been plain.

The medial wall is of special interest on account of its four or five unique or novel features. First of these is the great doorway which pierces the wall, connecting the exterior with the inner gallery and thence giving entrance to the court. It is 8 feet 10 inches wide and 18 feet high. The arch penetrates the thick masonry of the wall above, and the soffit surfaces are curved in a peculiar manner, giving a somewhat trefoil outline. The construction of this arch is illustrated in Fig. 11 of the introduction, Part I. The ceiling stones are as usual, and the length of the arch ceiling (the thickness of the wall at that level) is 7 or 8 feet. A second and very novel feature appears in the window-like openings penetrating the upper wall at the right and left of the doorway. They are also sub-trefoil in shape, are ceiled above with the usual slabs, are about 4½ feet wide and 5 feet high, and at the top about 6 feet long from face to face of the connected vaults. A third feature is a series of tau-shaped and squarish openings in the lower wall. A fourth feature is the large dumb-sheave cord holders at the sides of the door; and a fifth is the line of wall decorations alternating with the tau openings though somewhat higher up on the vertical wall space. These decorations seem to have consisted of medallion-like heads, possibly portraits, neatly worked out in relief, and surrounded by roundish, relieved framework, embellished on the outer margin with ornate, rococo-like appendages; these are best given by Charnay, although something has to be allowed in this case, perhaps, for the personal equation of the artist who drew the illustrations on wood. Besides these features there are a few pole sockets here and there in the soffit slopes. While some of these features are peculiar to this particular building, the descriptions cover about all that is worth mentioning in the walls of the other members of the north end of the group. The arches vary somewhat in height and width. The other medial-wall doorways have the plain arch, and the window-

PL. XIX. VIEW IN NORTHWEST COURT OF PALACE SHOWING DECORATED PIERS AND TOWER.

Looking to the southeast from the court we have the middle building at the left and the Tower beyond. Maudslay's men are seen at work uncovering the narrow stairway that ascends from the court to the middle building. Three of the piers are seen, bearing on their faces remnants of the stucco relief groups. Against the base of the Tower are remnants of an arch-pierced wall representing some structure not yet fully made out. Photograph by A. P. Maudslay.



VIEW IN NORTHWEST COURT OF PALACE SHOWING DECORATED PIERS AND TOWER.

like openings do not penetrate the wall but are closed with masonry, leaving shallow recesses only. The cord holders also vary somewhat, and the tau openings appear in cases as mere recesses in the walls. In one case, in the western building, near the north end, a window-like opening with angular, arched top penetrates the lower zone of the medial wall. It is 2 feet 6 inches from the floor and 2 feet 7 inches wide by 5 feet in height.

The northeast court measures 80 feet on the north, 72½ feet on the south, 75 feet on the east and 80 feet on the west, the datum points used, however, being somewhat indefinite and unsatisfactory. Its depth below the floor level of the building is 6 feet. From this court five buildings are in view; on the north we observe the range A, much broken down, forming a mere ridge of debris; on the east the building B presents a façade entire save for breaches over the doorways; on the south the principal building, J, is much dilapidated, while the building I, presenting its north end, is well preserved, (see panorama). The façade of D, on the west side of the court is one of the best preserved in Palenque. There are stairways ascending to each of the buildings, five in all. These stairways do not extend the full length of the sides. Those on the east and west, and that entering the Mural Tablet Building, at the southwest, are constructed of hewn stone, while those on the north and south sides are of loosely laid masonry that must have been veneered with stone or finished in stucco. The walls at the sides of the stairways on the east and west are finished with panelings of hewn stone, on which are sculptured figures or glyphs. The large inclined stones flanking these stairways are covered with colossal and unique human figures in relief constituting one of the most interesting and novel features of Palenque. The steps on the west side have glyphic inscriptions on the faces.

The northwest court measures 30 feet on the north, 37 feet on the south and 74½ feet from north to south. The datum points for these measurements, selected in haste, may differ from those selected by others. Its features and finish are much the same as those of the adjoining court, though some novel features appear at the south end. Several apartments, apparently of small size, seem to have existed in connection with the Tower, and a stair leads down beneath the north interior building, or between it and the Tower. It is possible that Mr. Maudslay, who must have carried on the extensive excavations observable in this court, has determined the nature and extent of the stairway and its connections.

The transverse section of the group, given in Fig. 51, bisects the terrace mass and shows the relation of the courts and buildings. The position of the sub-waterway is also shown.

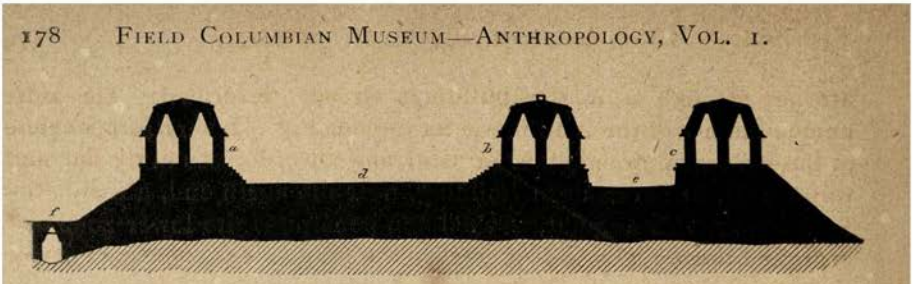


FIG. 51. TRANSVERSE SECTION OF NORTHERN END OF PALACE GROUP SHOWING BUILDINGS AND COURTS.

a. Eastern range.
b. Interior range.
c. Western range.
d. Great court (northeast).
e. Northwest court.
f. Waterway.

The dilapidated building (J on the map), separating the northeast court from the southeast space, extends from east to west and is about 42 feet long and 23 feet wide. It differs from the northern buildings in having its two vaulted galleries separated into chambers by heavy partition walls; three of these chambers are entered from the north and two from the south as shown in the plan. The middle room, entered from the north, occupies the full width of the building, the medial wall being penetrated by a wide, high archway, making the two sections coalescent. There are tau openings between adjoining rooms, and also one in the south end of the middle room. The southern rooms preserve traces of elaborate relief ornamentation, the principal remnant being a florid rococo-like design surrounding one of the tau openings. The ornament is richly colored, and is well illustrated by Charnay. In masonry, profile and finish this building is much like the others. The floor is apparently a few inches lower than the floors of its northern neighbors. The decay of the wood lintels has led to much breaking down over the doorways and the front half of the roof of the northwest chamber is gone. It is my impression that the narrow space between this building and the eastern range has been walled up and roofed over, though I made no very definite observations.

The building just described is joined on the west by another structure of exceptional interest (I). Part of its northern end is seen in the panorama. It extends from north to south, the north end connecting partially with the south end of the northern interior building. It could with propriety be called the southern interior building, but I prefer the title Mural Tablet Building on account of the handsome bas-relief imbedded in the wall of its west gallery. Its length is some 75 feet and its width 22 feet. The vaults are constructed as usual but

are not so high as in the buildings already described. The most unique feature of the building is its profile, Fig. 52. The upper zone of the wall is approximately vertical and the roof is nearly flat and without a crest. The section is, therefore, closely allied with the Yucatec section, and as this building is lower and more archaic looking than other equally well preserved structures, it is suggested that it may be the original type, from which the sloping roof form is a differentiation.

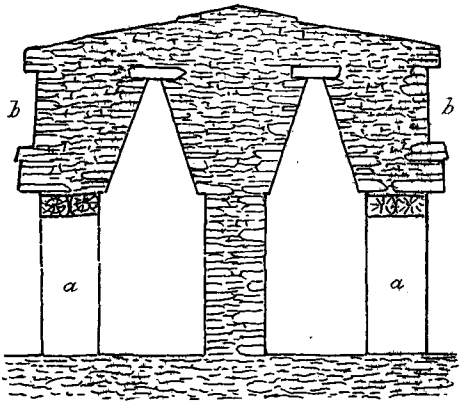


FIG. 52. TRANSVERSE SECTION OF THE MURAL TABLET BUILDING.

The upper wall zone is nearly vertical, thus suggesting the Yucatec profile.
a, *a*. Doorways with wooden lintels restored.
b, *b*. Steep upper wall-zone.

The roofless buildings of the southern courts call for but little attention. In the southeast court are the remains of a building, K on the map, that may be called the House of the Sanctuary; and another, M, of imperfectly defined character and extent, occupies the southwest corner of the farther court, Q, behind the Tower in the panorama.

I found the Tower to be a structure of unusual interest—largely because it is in many ways unique. It has been described in some detail by a number of authors, and some have ventured to illustrate its construction, but as these attempts at analysis seem unsatisfactory, I studied the structure with exceptional care and shall go over the ground as thoroughly as possible. It is a square building of four stories, three principal and one inferior, and has a stairway extending upward through the center of the four floors. It is seen in the panorama rising behind the northern interior building, and its height —suggestive of the feudal citadel—lends an air of the picturesque to the otherwise squatty and monotonous pile of ruins. It is in an

advanced state of ruin. The upper story is half gone; the doorways (more correctly windows) are broken out above, and the masonry has been denuded of the coatings of plaster and color that once made it an attractive feature of the group. It was probably an observatory, the upper windows and roof commanding a view of all the surrounding buildings. The construction is such as to strongly suggest this use. The stairway and windows are manifestly the main features. The inclosed spaces or galleries are only of sufficient width to serve as passageways from window to window and from stair to stair, the only exception being some small, dark chambers in the blind, second story. To be sure it may have been used for defense, and some ceremonial function may have been subserved, but the chief purpose was certainly that of an outlook.

It was much obscured by vegetation until cleared off by explorers, and full-grown trees still cling to its crags. The network of roots and vines with which it is held together bears evidence of the mighty vigor of the tropical forest.

This tower strikes me as belonging to the earlier stages of the growth of the Palace. Its foundation is as low or lower than the level of the courts, and it is enclosed on two sides by what appear to be later structures, built like honey cells against its sides.

The exterior is best described in connection with my drawing, Fig. 53, taken from the northeast—nearly the direction from which the top is viewed in the panorama. I have omitted the attached structures, which obscure the base on the north and west, and present the walls in their original simplicity. A photographic view from the northwest is given in Pl. XIX, which shows fully the character of the masonry, the windows and the inclosing remains, as well as the relation of the structure to the north interior building, at the south end of which it stands.

Rising from the body of the terrace we have the base of solid masonry, about 23 feet from east to west, and 25 feet from north to south, and perhaps 10 feet in height. The corners are enforced by slight masonry projections, and a wide, strong cornice incloses the top. Above this rise the other zones of the structure, each limited above by a narrow, square cornice and each in turn reduced a few inches in horizontal extent. There are thus six offsets, and these, with a very slight inward slope of the walls, narrow the top to about 16 by 18 feet.

Above the foundation space there are three narrow zones, entirely blank, and three wider zones containing the openings or windows. These wider zones mark the three principal stories of the build-

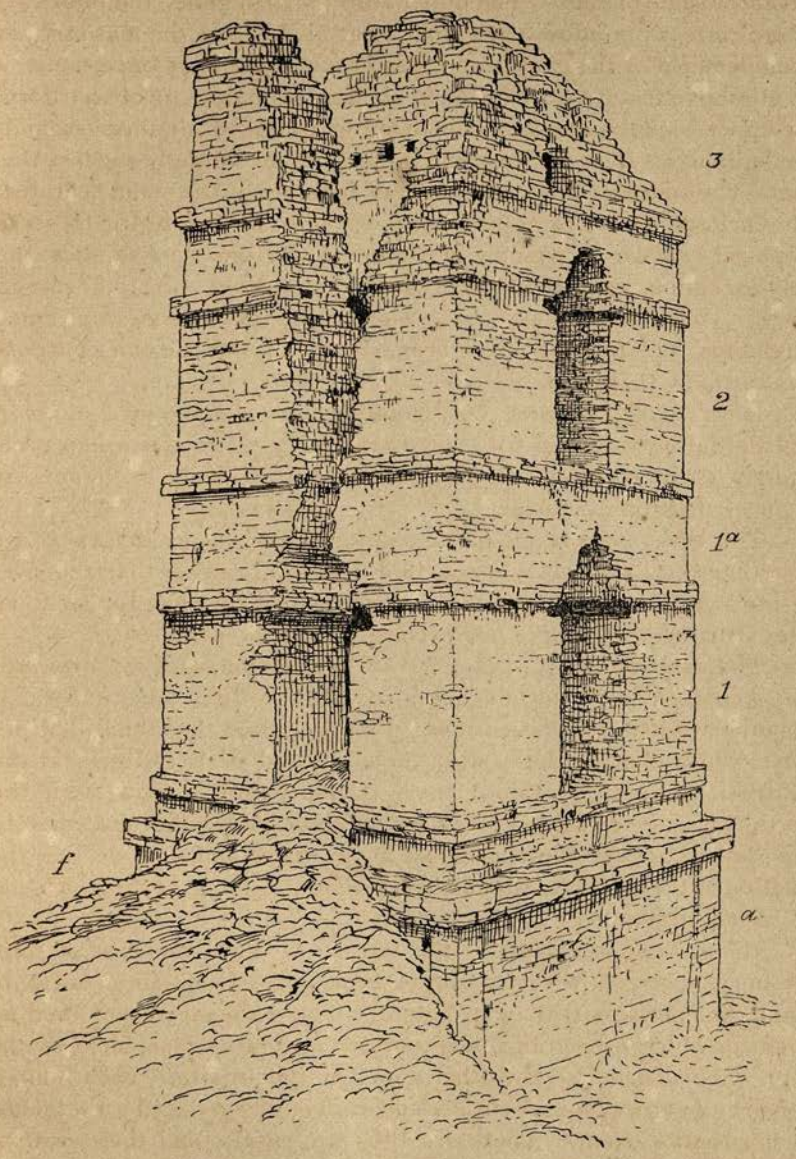


FIG. 53. SKETCH OF THE TOWER FROM THE NORTHEAST AS IT WOULD APPEAR DENUDED OF VEGETATION AND EXTRANEOUS MASONRY.

The base, upwards of 20 feet square, is believed to be of solid masonry. The stories are marked 1, 1*a*, 2 and 3. The height is about 40 feet. Masonry of smallish, slightly dressed stones and mortar. Surface, inside and out, plastered and painted.

For details of stonework and present appearance of structure, see Pl. XIX.

ing, while a blind story, having no exterior openings save minute air holes, occupies the space within the second narrow zone and just over the lower story. I was unable to determine which of the four lower story openings served as the doorway, as there are no traces of a stairway, but entrance may have been obtained from a cluster of constructions, remnants of which appear on the north and west sides. The roof of these constructions was apparently on a level with the floor of the lower openings. Entrance to the tower, (Fig. 53), is now obtained by way of the east opening, from which a heap of debris extends down to the terrace level. By climbing this debris slope we reach the first floor and find the space within largely occupied by the stairway, which ascends through a centrally placed square column of masonry; indeed the free space, by means of which we pass around the central column to the other openings and to the entrance of the stairway on the west side of the column, is nowhere over two feet wide. The construction and arrangement are fully shown in the section, Fig. 54; and the graphic section, Fig. 55, shows the first floor, with one of the corner piers of the structure removed.

It will be seen by reference to the ground plan of the first story, Fig. 56, that the corner piers are very heavy, measuring 5 feet and a few inches in thickness on the east and west sides and between 3 and 4 feet on the north and south sides, while the windows on the east and west are 6 feet wide, and on the north and south nearly 5 feet wide. The inclosed space is thus much limited, and the stairway column takes up 5 by 10 feet of this, leaving a passageway in places less than 20 inches wide.

The first flight of stairs is entered by a small doorway (*b*, Fig. 55) on the west side, and ascending a single step we enter a minute passage which extends to the center of the column, *e* on the ground plan, and from this we turn to the right up a flight of eight or nine steps,* landing on the second floor facing the south window, as indicated in the plan at *f* and in the section at *e*. The exterior characters of the stairway column and the entrance to the stair are well indicated in the graphic section, Fig. 55. In this illustration I have removed the near corner pillar (its position being indicated by the space shaded with dotted lines), and part of the pillar at the left, as well as a slice from the whole upper part of the building, the thickness of which is indicated by the dotted profile at the left. This lays bare the whole construction, exposing the central column, the windows with their wide jambs and wood lintels (restored to accord with the sockets which still exist), and the slab ceilings of the passageways. The height of the first story is about eight feet, interior measurement.

*Some of my sketches indicate nine steps from floor to floor while other sketches and notes show ten.

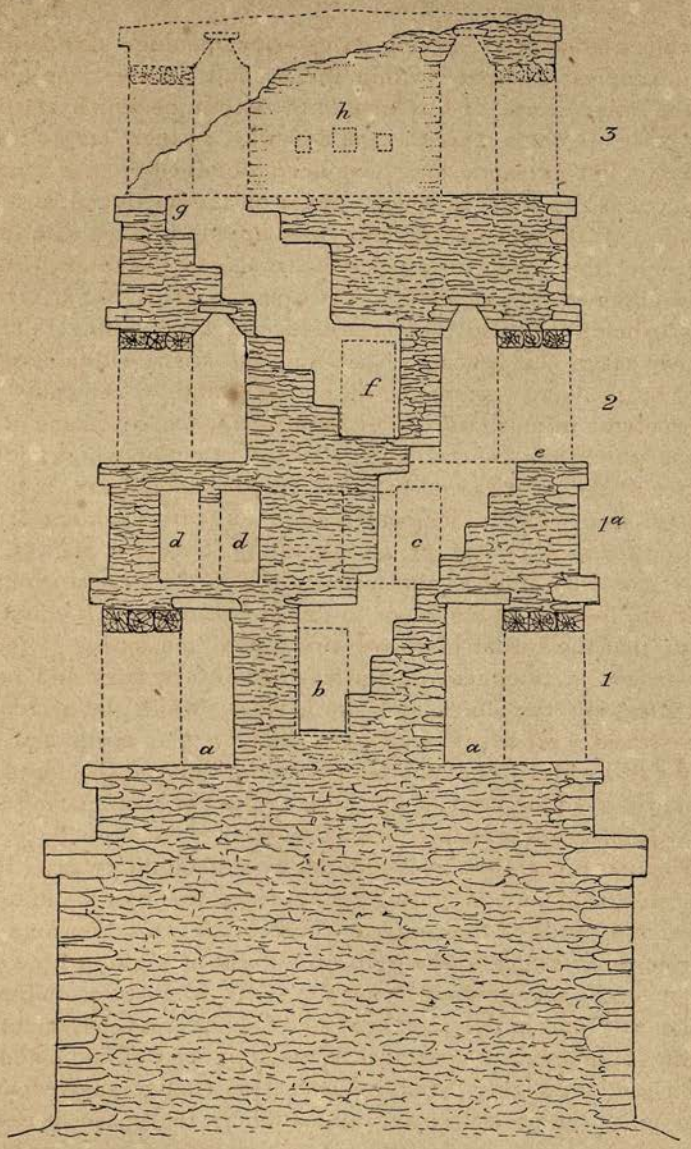


FIG 54. SECTION OF TOWER FROM NORTH TO SOUTH, SHOWING STAIRWAYS AND CONSTRUCTION.

The base is apparently a solid mass of masonry. The stories are marked 1, 1*a*, 2 and 3. The wooden lintels are restored to agree with the sockets.

a,a. First floor passage with doorways at right and left.
b. Entrance to stairway one step up from first floor.
c. Opening from fourth or fifth step of stair to blind story.
d,d. Passage and minute north chamber of blind story, position with reference to walls of Tower not fully defined.
e. Landing in south doorway (window) of second story.
f. Entrance to stairway of second story.
g. Landing on third floor, partially blocked by debris.
h. Small openings seen in east wall of stair shaft, third story.

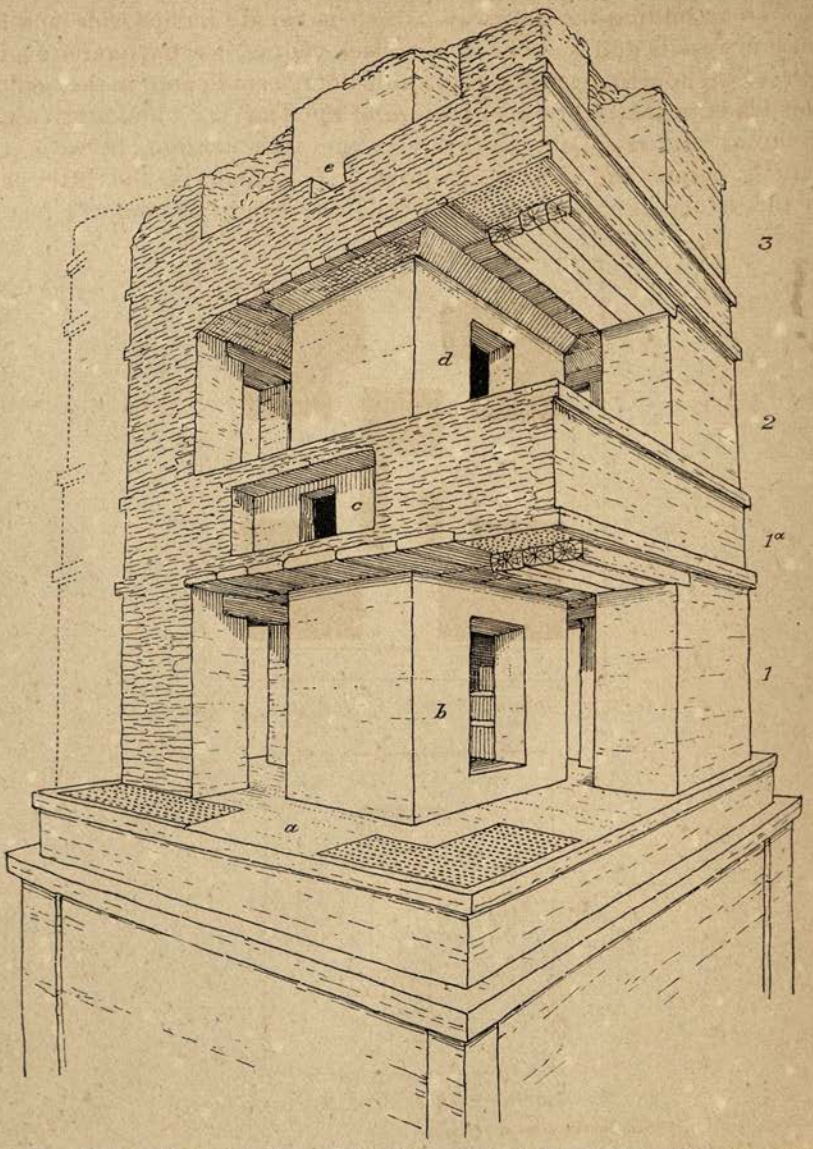


FIG. 55. PARTIAL SECTION OF TOWER EXHIBITING VARIOUS FEATURES OF CONSTRUCTION.

The stories are marked 1, 1*a*, 2 and 3. The wooden lintels are restored to agree with sockets. The near corner pier has been removed in the first and second stories to show the stair column, and a slice is taken from the whole north front above the first floor.

a. First floor; dotted spaces indicate position of removed pier.
b. Stair column with entrance to first flight.
c. Minute north chamber of blind story.
d. Second story, showing entrance to second flight of stairs.
e. Landing of second flight of stairs on fourth floor.

In ascending the stairway, which is twenty inches wide and has masonry walls and a stepped or offset ceiling, we encounter on the left, at the fourth (or fifth) step, a side door, as indicated in the section; this leads to the most novel feature of the Tower, a blind story which occupies an irregular space about the stair column between the ceiling below and the floor above. The plan of the little cells of this story is given in Fig. 57. The height is about 4 feet 6

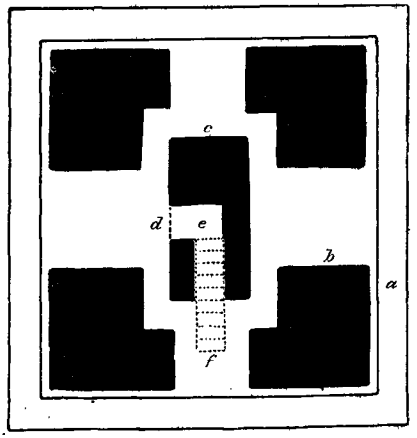


FIG. 56. GROUND PLAN OF FIRST STORY OF TOWER.

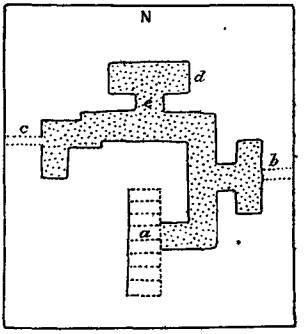


FIG. 57. GROUND PLAN OF BLIND STORY OF TOWER.

a. Entrance from fourth step of stairway.
b, *c*. Air holes.
d. Minute north chamber.
e. Doorway from passage to north chamber.

inches, and so far as I could determine no light was provided for, save that which came down the stairway from the south window and entered by the doorway at *a*. Naturally the northern and western extension of the minute gallery, which passes along the east side of

the column and around the north and west, was very dark, and the north chamber, *d*, entered from the gallery by a miniature door, *e*, had to be explored with a candle, though light is now admitted to some extent through a breach in the wall and floor of the passage over the east door of the story below. The door, which is 20 inches wide and some 45 inches high, and the chamber, which is only 2 feet wide and 4 feet 8 inches long, are shown in the graphic section, Fig. 55, at *c*.

The second story—or the third if we count the blind story—repeats the first story very closely and need not be described, save to indicate that the roof of the passageway is arched and not flat as in the lower story. In the latter, flat slabs were used because an arch would have taken up the room needed for the blind story, which has but 4 feet 6 inches of space as it is. The nature of the construction is clearly shown in the section. The height of the doorways is about 6 feet and of the ceiling about 7 feet. At this level the tower approximates 18 feet from east to west, and 20 feet from north to south.

The stairway to the third or top story is entered by a doorway (*d*, Fig. 55) in the west side of the supporting column, corresponding in position and appearance with the entrance on the floor below, and seven steps (width 26 inches, rise 16 inches, tread 10 inches) lead up to the landing at *e*. The ascent is to the north, the reverse of that of the lower stairs, so that the landing was in front of the third window on the north. The flat stones of the fallen roof of the top story now partially close the upper end of the stairway, *e*, and at the time of Stephens' visit closed it so completely as to lead him to believe that the stair passage ended here. Passing out of the debris-blocked opening I found that the upper story—that is to say the uppermost story of which traces now exist—was about half standing, though the roof had fallen in and the central or stairway column was covered by a mass of loose stones. It is impossible to say with certainty, without excavation, whether a third flight of steps, leading up to a fourth floor or to the roof, ever existed; but I found traces of three small openings in the north side of the column, (see Fig. 53), which may have served the purpose of lighting a stair passage, or, otherwise, a minute central chamber.

TEMPLE OF INSCRIPTIONS. Of the several isolated temples now standing in Palenque the Temple of Inscriptions (B in the panorama), is the largest and best preserved. It differs from the others in several particulars. The sanctuary has no tablet room, such as are seen in the other temples, and the great tablets, placed

two at the sides of the sanctuary door and one against the back wall of the sanctuary, contain only hieroglyphics. These are the largest and most important mural inscriptions found in America and are in the usual style of characters and in low relief.

The pyramid is 50 or 60 feet in height and stands so close to the southwest corner of the Palace platform that the adjacent corners seem to coalesce to a slight extent. The slopes are steep, reaching approximately 45 degrees, and are so covered with debris and vegetation that only small portions of the surface can be seen. A platform, some 12 feet wide, occurs near the top, and from this, midway in the front, a few steps of well hewn stone lead to the summit; at the sides of the stair are sloping sculptured slabs forming a kind of balustrade. The pile is long and narrow, and the building, as seen behind the Palace in the panorama, is set high against the dark forest-covered hillside. Other inferior structures, entirely hidden by the dense foliage, stand adjoining this at the west end.

The length of the building is 75 feet, the width 25 feet, and the full height probably between 25 and 30 feet. It faces north 14 degrees east, magnetic, which is a variation of 4 or 5 degrees from the orientation of the west wall of the Palace.

The walls are about 4 feet thick and the construction and finish are as usual. The profile corresponds closely with that of the north ranges of the Palace, and the roof-comb is similar to that of the northern interior building. Within are two great vaults, nearly 70 feet long and a little less than 7 feet wide. The front vault—the corridor of the temple—is entered by five wide doorways (seen in the panorama), and the three rear apartments, into which the back vault is divided, are entered by one doorway each. The exterior openings are square and were spanned originally by wooden lintels, while the inner are arched. There are no other openings, save a number of small squarish apertures piercing the outer walls. The floors are paved, in part at least, with slabs of limestone. The two important and striking features of this strange building are the stucco embellishments of the exterior, and the inscribed tablets within. The exterior decorations are mainly in stucco. The four free pillars contain on their outer faces, modeled in bold relief, life-sized figures of women holding children in their arms; while the wide lateral wall-fronts, or antæ, are covered with glyphs. The lower zone of the roof has been richly embellished with figure subjects, now nearly obliterated, the effect having been varied by decorated projections over each doorway. The upper slope and the roof-comb show no decorations. These various features are but imperfectly indicated in the panoramic view.

The inscribed, limestone tablets, occupying the back walls of the vestibule and sanctuary, are well presented in the work of Stephens. His plates bear witness to the courage and patience of Catherwood, and to the remarkable accuracy of his pencil. They have been further brought before the world by the excellent casts of Charnay, now found in numerous museums.

TEMPLE OF THE BEAU RELIEF. Leaving the Temple of the Inscriptions we descended to the bed of the creek at the corner of the Palace and, following one of its dry freshet-cleared channels, thus partially avoiding the undergrowth, soon obtained a view of the small but interesting Temple of the Beau Relief, which is hardly more than 500 feet from the south end of the Palace, and is seen in the panorama at C. The stream runs hard in against its west bank at this point, cutting into the limestone beds beneath the ruin; and less than 100 feet farther down it sinks gradually out of sight, finding its way into the clogged upper end of the ancient, arched waterway. The forest-clad hill rises at a steep angle and is covered with debris from the ruin which is perched upon a narrow ledge built against the precipitous slope some 75 feet above the stream. This ledge or shelf, which took the place of a pyramid, was not more than 25 or 30 feet square, and was probably faced with stone on front and sides; and doubtless a stairway led up the middle from the stream bed or from a horizontal roadway or terrace now obliterated. The temple was about 20 feet square and was entered, according to early drawings, by a single square doorway; from this, with the forest cleared away, a fine view could be obtained of the temples opposite and the valley below. It faces east, varying but two or three degrees from the magnetic orientation. The breaking down of the substructure at the outer margin has undermined the façade and this and portions of the lateral walls have fallen, leaving the ragged edges of the end walls and roof exposed. At the left in the crumbling mass of the terrace, a small basement room is partially exposed, and above we see the inner wall of the vestibule, vertical and plain below and sloping forward above, indicating the usual vault. In the center of this wall is the squarish doorway leading into the sanctuary or tablet chamber. The lintel, which was probably of zapote, is gone and the wall is cracked above; but the jambs are well preserved and are faced each with the remnants or imprints of two vertical rows of stucco glyphs.

The sanctuary is an arched chamber of usual construction and appearance. It is 6 feet 2 inches wide and 17 feet long. The walls are 8 feet high to the spring of the arch, and retain their plastered surface in part only; they are 2 feet 2 inches thick and have several

small squarish perforations. The sloping upper walls are pierced with beam sockets as usual.

The various constructional features are well shown in the accompanying section, Fig. 58, though the profile of the roof is not very definitely made out.

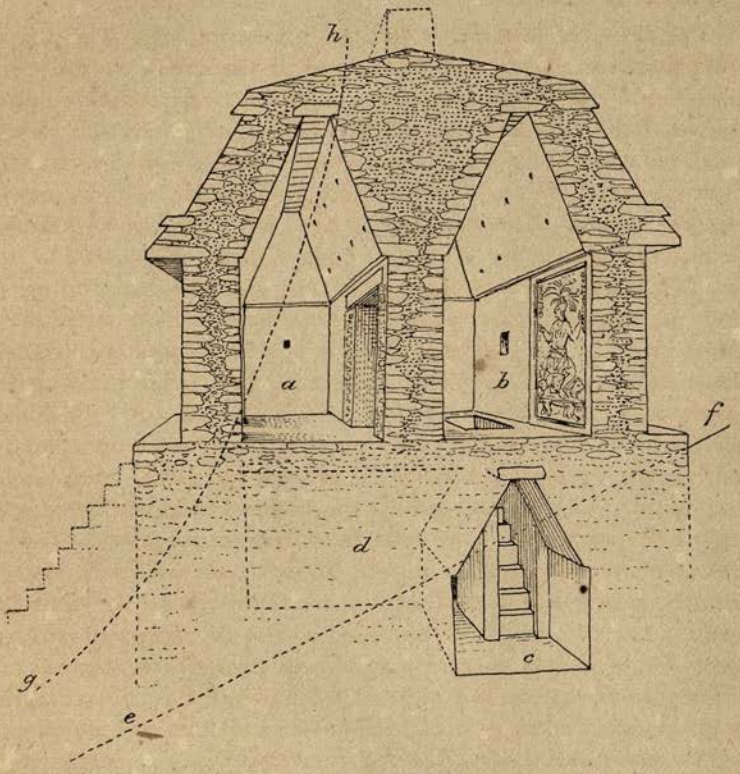


FIG. 58. SECTION AND PERSPECTIVE OF THE TEMPLE OF THE BEAU RELIEF.

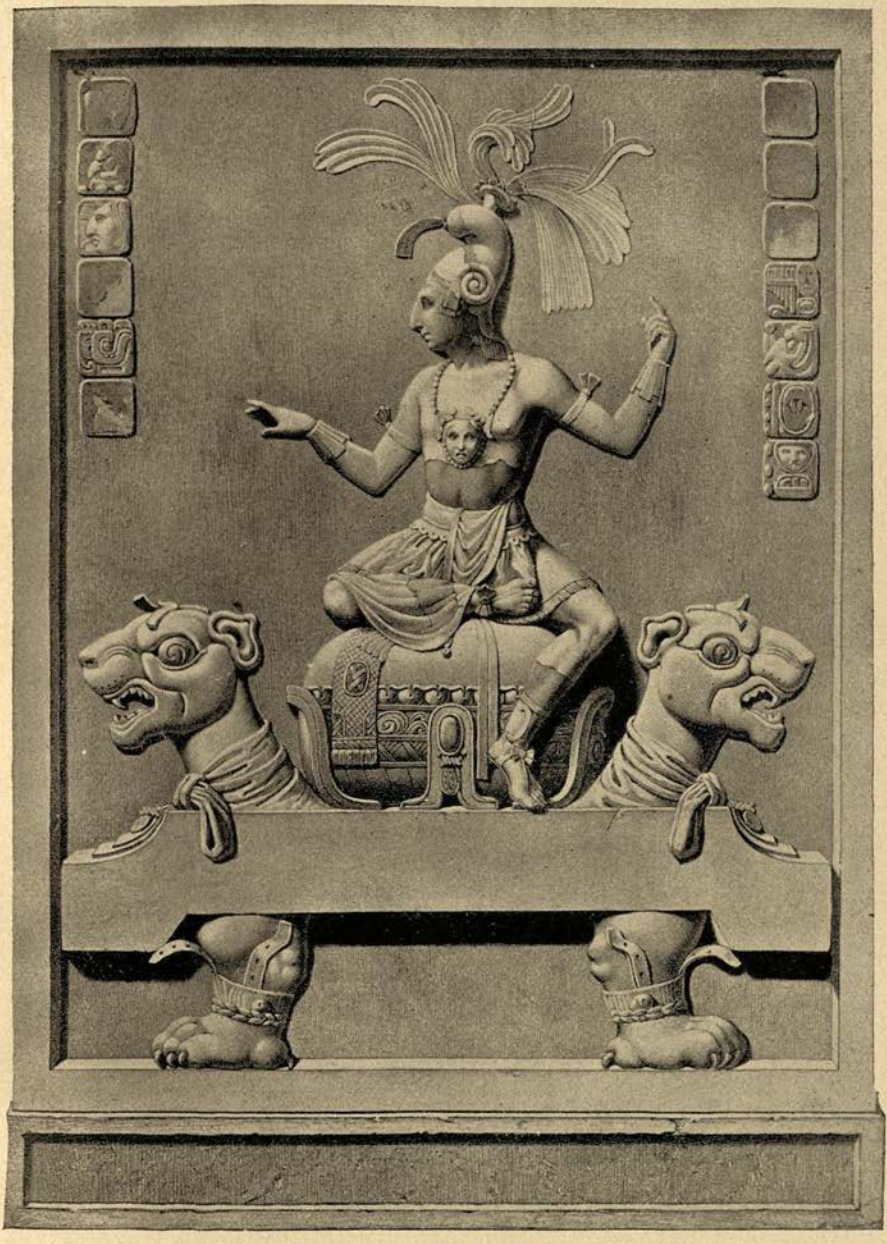
a. Vestibule showing entrance to sanctuary bordered by glyphic inscriptions; wooden lintel restored.
b. Back vault or sanctuary showing the Beau Relief and entrance to basement stair.
c. Basement chamber at foot of stair, north extension.
d. East extension of basement chamber.
e-f. Slope of mountain side.
g-h. Line indicating portion of front of building destroyed.

A remarkable feature of this building is the basement apartment and the stairway leading down to it through the floor of the sanctuary, as indicated in the illustration. There are seven steps, each with 15 inches rise and 8 inches tread. The principal chamber corresponds in length and width with the sanctuary above, but is only 7 feet in height and is partially occupied by the stairway. A small vault

extends from this apartment forward under the south end of the vestibule. The plans given by Bancroft are correct in nearly every particular.

The most interesting feature of this temple was a stucco bas-relief—taking the place of the limestone tablets of other temples—the remnant of which occupies the middle of the back wall of the sanctuary, opposite the doorway. Charnay states that the relief is entirely obliterated, but I find that nearly one-third remains and affords an opportunity of determining the nature and style of the work. The subject, as depicted by Waldeck and reproduced by Bancroft and others, consists of a single figure, nearly life size, seated in a graceful pose on a throne which terminates at the right and left in tiger heads, the conventional, angular seat being supported by two legs modeled to represent the feet of the animal. I consider it a piece of great good fortune to have had the opportunity of examining the remnant of this remarkable masterpiece, and take especial pleasure in testifying, so far as a study of the fragment will warrant, to the accuracy of the descriptions and drawings published by some of the early explorers. No part of the human figure remains save perhaps a bit of the right knee, and the tiger heads are nearly all gone; but, with the engraving published by Bancroft in my hand, I studied the remains of drapery and the modeling of the animal features of the chair with great minuteness, finding the drawing absolutely accurate save that the artist has not caught, or the engraver has failed to preserve the full spirit of the work. The drapery is modeled in a masterly way and the subtle lines of the foot and claws of the cat are forcibly suggested. I must acknowledge having harbored a feeling of skepticism, awakened years ago, as to the truthfulness of Waldeck's drawing. I believed that the graceful pose of the body and limbs of the figure, the flowing yet vigorous plumes and drapery, and the refinement of the relievo modeling, were beyond the reach of native skill, but having seen what is left of the original I am willing to accept the drawing of Waldeck as an excellent interpretation if not an entirely satisfactory copy of the work. While there is certainly some loss of native character and force there is probably also a little over-refinement of drawing and finish, natural enough in the work of an accomplished artist not deeply impressed with the importance of scientific accuracy. The illustration of the same subject published by Dupaix is, in my opinion, hardly above the rank of a caricature. A photographic reproduction of the lithograph published by Waldeck is presented in Pl. XX.

As a work of art this bas-relief would not suffer by comparison with representative relief sculptures of Egypt, Babylonia and the



STUCCO ALTAR-PIECE KNOWN AS THE BEAU RELIEF. AFTER WALDECK

far East, and in balance of parts and grace of line has few rivals. The right hand of the figure is extended as if to call attention to the inscription toward which the face is turned, while the left hand is raised, the index finger pointing upward.

The imprint of portions of the figure still remains upon the wall, and the remnant as it stands affords an excellent opportunity of studying the technique of the worker in stucco. The roughly laid up wall was covered somewhat evenly with plaster, then as the modeling advanced, if the relief was high, bits of stone were set in, making a framework for the prominent features. Where strong projecting portions were to be added shallow pits were dug in the masonry as sockets for the projecting stones. Mortar was then carried over all, rough shaping the form; perfection of modeling was made possible by employing finer grained mixtures, and finish was given by polishing and painting.

Of the two lines of inscriptions three glyphs remain nearly intact —the second from the top at the left and the third and fourth from below on the right. Outlines of others are seen as indicated by Waldeck. The glyphs were modeled separately and set, after hardening, into the bed of soft plaster.

The inclosing framework of the picture is neatly executed, though it has not quite the mechanical precision indicated by Waldeck. It is 3½ inches wide, save at the base, where it is about 6 inches wide, and the inside measurement is 73 inches horizontally and 90 inches vertically. Its relief is 1½ inches. A rough hole in the wall, behind the point of the right elbow of the figure, probably had nothing to do with the relief and may be of recent origin.

EAST SIDE REMAINS. On the east side of the channel of the Otolum we have an interesting group, consisting of three well preserved temples and several mounds some of which retain remnants of walls. In the panorama they are at the left and occupy a system of terraces from 30 to 50 feet in height that rises abruptly from the stream level and extends back some four hundred feet to the base of the mountain spur. The three main temples face a depressed, squarish space a few hundred feet wide, which has near the center a heap of stones representing some small structure. This space may have served as a court in which were conducted ceremonies pertaining to the temples. This arrangement is repeated on two terraces rising one behind the other to the south; the front line of structures is thus separated from those set against the base of the Cerro. Owing to the position of the buildings, only rear views of the Temples of the Cross and Sun are obtained in the panorama, while the broken façade of

the third—the Temple of the Cerro or Cross No. 2—is barely visible beyond the Temple of the Cross.

TEMPLE OF THE SUN. This temple is one of the best preserved of the Palenque buildings and may be presented in some detail as a type of its class. It is inferior in size and architectural pretensions to the Temple of the Cross, but resembles it closely in every important particular. The pyramid is hardly more than 20 or 25 feet in height and is so close to the terrace front that its outer slope coincides with that of the terrace. A mound of inferior size adjoins this on the north and annexed piles extend toward the Temple of the Cross; while a larger pile rises on the south, and still another occupies the margin of the terrace opposite the Temple of the Beau Relief. In most of these mounds traces of ruined walls are visible. In the panoramic view we see the north wall and the west or back wall of the Temple of the Sun. The front elevation, facing the east, is shown in Pl. XXI; the view is reproduced from a photograph very kindly placed at my service by Mr. A. P. Maudslay. This energetic and successful explorer has in preparation a paper on Palenque, to be accompanied by many of his superb views, which will undoubtedly be by far the most important contribution to the world's knowledge of these remains. An excellent illustration of this building is given by Charnay, and Stephens and Waldeck have furnished very careful drawings. The building is 38 feet long by 28 feet wide, and the full height, including the roof-crest, is about 35 feet. The walls are about 3 feet thick and rise vertically to the height of 10½ feet. The interior comprises the usual pair of longitudinal vaults, each between 9 and 10 feet wide and a little over 20 feet high. The soffit surfaces, sloping in from all four sides, rise at an angle of about 70 degrees, and the capstones forming the ceiling are exposed to a width of 2 feet.

The front vault—the vestibule of the temple—is shown in the sketch (Fig. 59) as it would appear if the end wall at the south were removed. The floor is now much obscured by debris but appears to be surfaced with cement. At the right are the three doorways, separated by two squarish piers. The middle span is much broken down above, but the lintel sockets are still visible and I have restored the timbers that the construction may be better understood. The exact present condition is shown in the photograph, Pl. XXI. The outer faces of the piers were covered with stucco figures and glyphs, as shown in the view, but the interior surfaces are all plain. At the left are three doorways, perforating the thick medial wall which separates the front and back vaults. The middle opening gives entrance to the sanctuary, and is about 8 feet wide, and being arched above

it extends high up into the massive masonry of the upper wall. Smaller doors, of like construction, but confined to the lower wall-zone, occur at the extreme ends of this wall and afford entrance to the two antechambers adjoining the sanctuary. Over the north doorway perforating the soffit slope is a coffin-shaped opening resembling

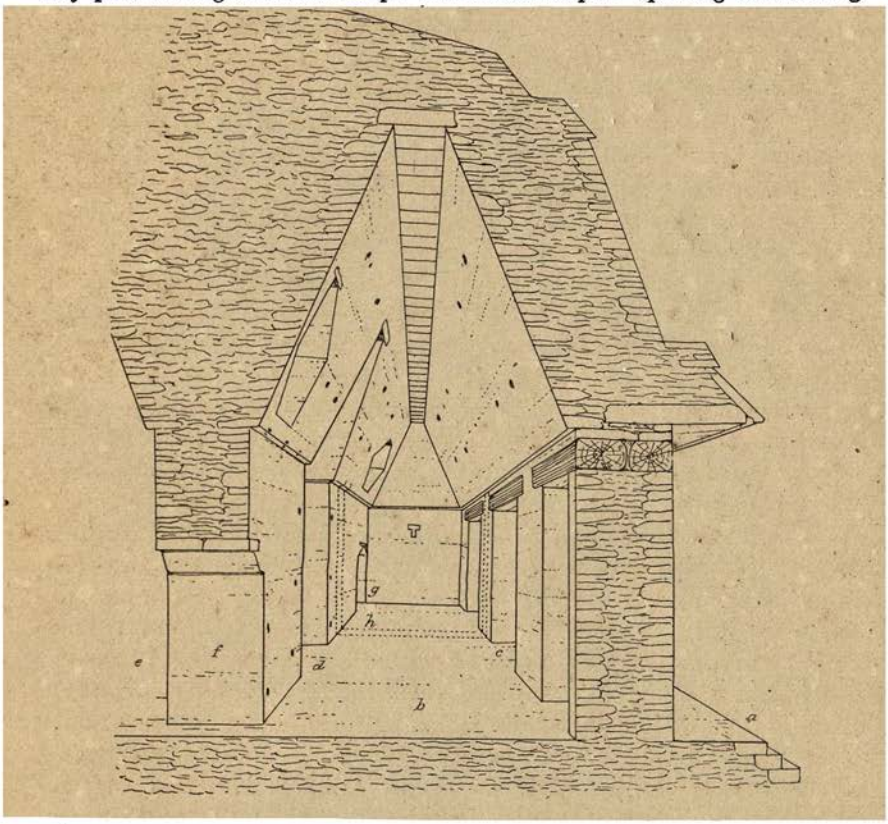


FIG. 59. SECTION AND PERSPECTIVE OF OUTER VAULT OR VESTIBULE, TEMPLE OF THE SUN; LOOKING NORTH.

a. Stairway, east front.
b. Floor of vestibule.
c. Middle doorway with wooden lintel (restored).
d. Doorway to sanctuary; cuneiform arch.
e. Back vault (see Fig. 60).
f-g. Doorways to antechambers.
h. Traces of partition wall, indicated by dotted lines.
Other features as usual.

the corresponding features in the Palace, already described, and another like opening over the south door has been closed by masonry. Above we have the soffit slopes, narrowing up to the capstones. The farther end of the chamber has a tau-shaped opening of usual style,

and another occurs in the south end. The plastered walls are further broken by pole sockets scattered over the soffit spaces, and by numerous dumb-sheave cord holders, some built into the walls at the

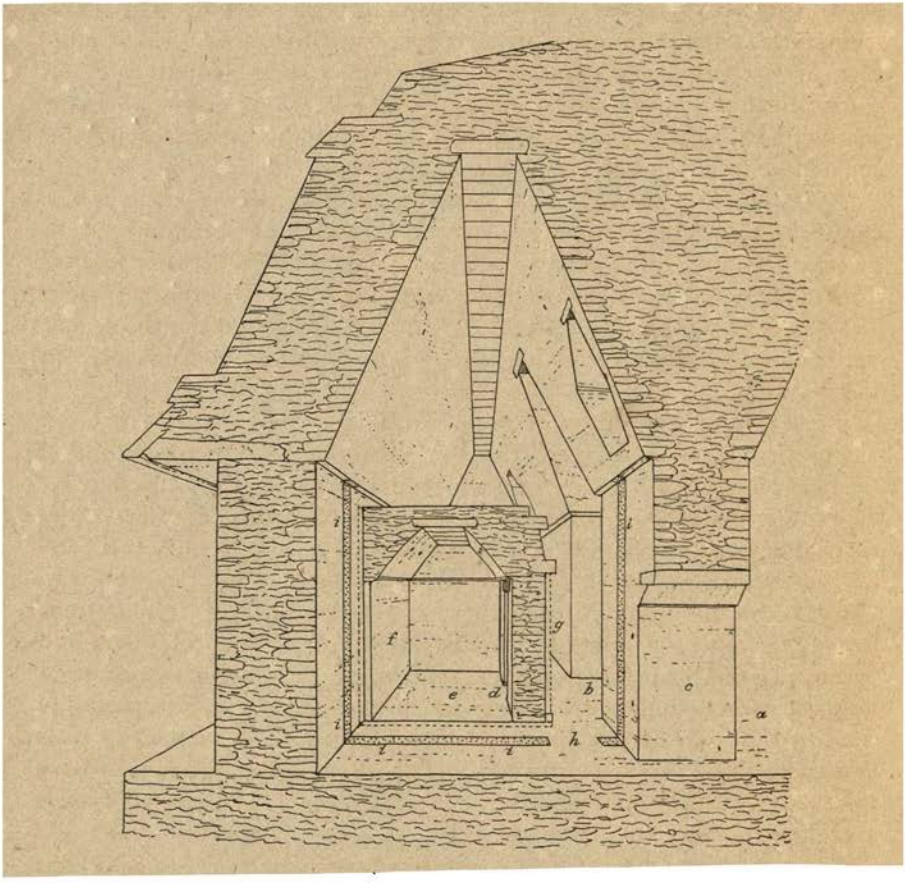


FIG. 60. SECTION AND PERSPECTIVE OF BACK VAULT (SANCTUARY AND ANTEROOMS) TEMPLE OF THE SUN.

a. Front vault or vestibule (see Fig. 59).
b. Doorway connecting vestibule with sanctuary.
c. Lateral doorway connecting vestibule and antechamber.
d. Doorway into tablet chamber.
e. Floor of tablet chamber.
f. Sacred tablet. (See Pl. XXII.)
g. Dotted vertical line indicating former position of antæ relief.
h. Doorway through partition.
i-i. Partition wall separating sanctuary from antechamber, omitted to give view of tablet room, the near end of which is also removed to expose the interior.

sides of the doorways and others perforating the projecting edge of the offset at the spring of the arch. Just beyond the main doorway are traces of a thin partition wall that must have separated the vesti-

bule into two sections of unequal dimensions. The walls of this, as well as of the other apartments, are quite rough and much coated with calcareous deposits distributed by percolating waters.

In Fig. 60 I present a section and sketch of the back vault, the southern wall being removed to give necessary distance and exposure. Also the partition wall—indicated by dotted lines—separating the south antechamber and the south end of the box-like tablet room, are omitted, so that the construction of all the peculiar features may be apparent.

The tablet chamber is placed against the back wall, the tablet appearing at *f*. It is arched as are the greater chambers, and has its pole sockets and dumb-sheave cord holders as do the other vaults. The center of the floor, *e*, has been dug up by some explorer, probably Del Rio. The doorway, with lintel restored, appears at the right, and outside, penetrating the medial wall, is the great arched doorway to the vestibule.

The front of the tablet chamber is the only part that has received any particular attention from the decorator, but the breaking out of the doorway above has nearly destroyed the handsome stucco over-door design; and the sculptured tablets that formerly faced the exterior of the door jambs have been removed, leaving only the plaster beds with their roughened surfaces as prepared by the workmen who set the tablets. An excellent representation of this curious façade is given by Stephens*; the two jamb tablets are in place and portions of the beautiful tablet are seen within. The over-door ornament, of which small portions remain at the right and left, probably embodied a pair of the peculiarly conventionalized serpent devices characteristic of Usumacinta art. The roof is flat, the height is 10 feet, the width 6 feet and the length 11 feet. The ground plan is shown on the accompanying map.

The exterior features of the building are shown in Pl. XXI, but deserve brief review. The two free piers, separating the portal into three sections, retain fragments of the stucco figures which formerly covered them; and the side piers, or antæ-fronts, have been occupied by glyphs, two examples of large size and elaborate design still retaining their places on the left-hand pier. The ends and back wall present plain, rather roughly plastered surfaces, varied only by the minute window-like openings. There is a projection of masonry at the floor level, and below this the wall faces, where exposed, descend vertically. The eaves, which correspond to the medial wall-molding of the Yucatec buildings, are very pronounced and bold, projecting 3 feet and retreating above at a sharp angle, thus connecting

*Incidents of Travel. Vol. II, facing page 354.

gracefully with the steep slopes of the roof. This great projection is secured by setting large slabs upon the top of the walls and facing the sloping, outer surface with a course of rather roughly hewn stones as shown in some of my sections. The outer margins of the eaves-slabs are perforated at intervals of a few inches by holes for cords, intended no doubt for supporting awnings or screens.

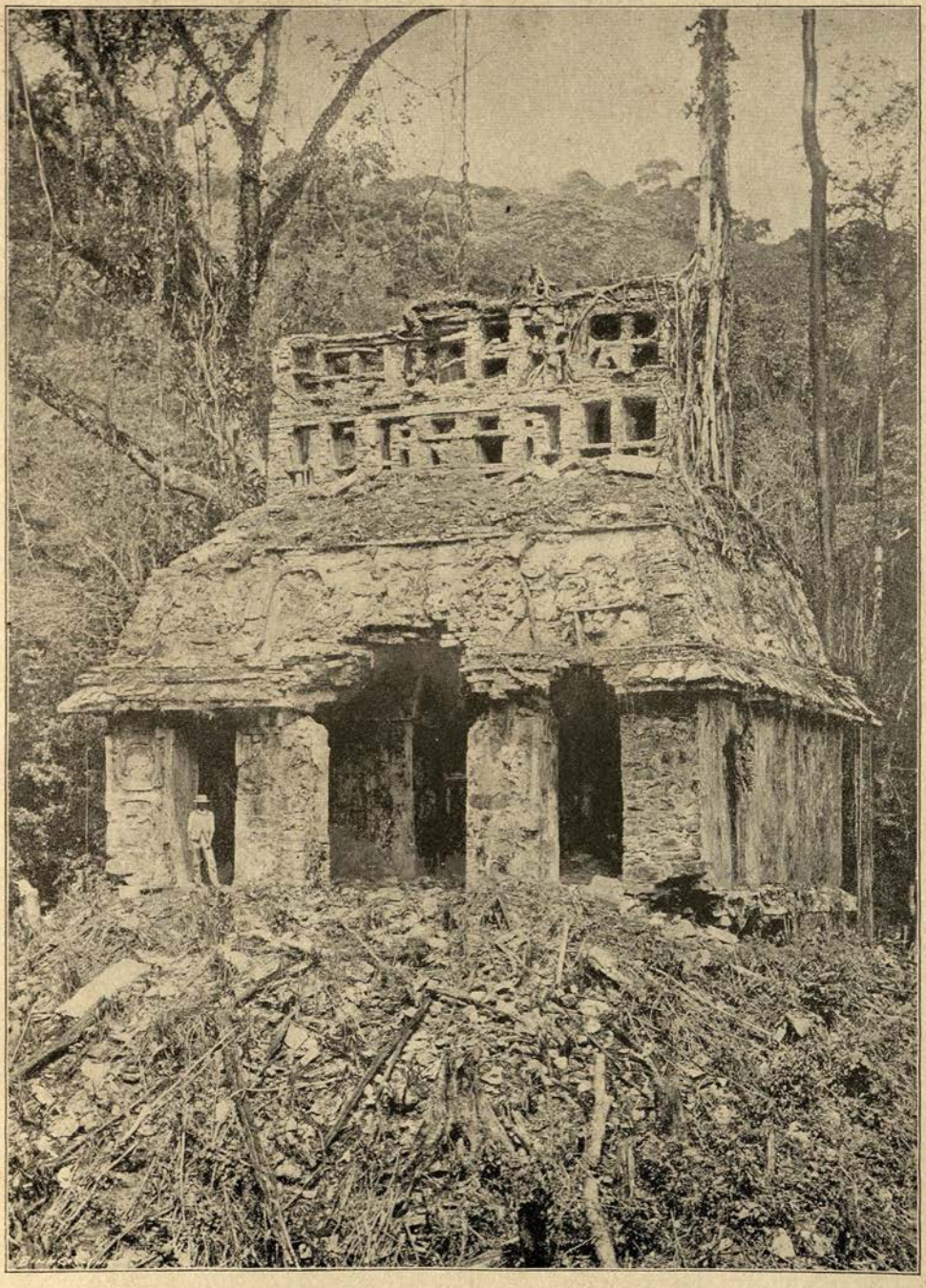
The roof of this building is of great interest. Its conformation suggests the mansard of our domestic architecture, the profile being nearly uniform on the four sides and receding in two principal stages. The wide lower slope, corresponding to what I have called the entablature zone in Yucatec buildings, pitches back from the eaves-moldings at an angle perhaps a little greater than that of the arch soffit within. It is about 7 feet wide and is bordered above by a second but less pronounced set of moldings corresponding to the frieze or coping moldings of the Yucatec buildings. These also incline backward and are followed by the upper or roof-space proper, which is about 6 feet wide at the sides and extends back at a very low angle to the base of the roof-comb.

The upper sloping space seems to have remained plain, which is reasonable, as it would not be in sight from any available point of view; but the lower zone has been embellished all the way around and furnishes one of the most remarkable illustrations extant of the ambition and ability of the Maya decorator. The subjects, undoubtedly mythologic and germane to the functions of the temple, were wrought out in stucco in high, round relief, and—though now badly broken up—enough remains to show that they were analogous in character to better preserved, though less pretentious, examples of the same class. The style is even more florid than usual. On the east side or front (Pl. XXI), we detect the form of a serpentine monster covering nearly the entire space, 21 feet long by 7 feet wide, with other figures and appendages filling the interspaces. At the right is the figure of a man kneeling upon a framework, beneath which are traces of a grotesque face of large size, with bulging eyes, reminding one of the wild-eyed monsters of some of the Javanese ruins. The border of this great panel, formed of the lower and upper moldings and the sloping corner pieces, was no doubt furnished with appropriate, conventional ornaments.

The roof-comb which, as it stands to-day, is well shown in Pl. XXI, consists of a very narrow vault, extending the full length of the roof, and is 2 feet wide within and 12 feet high; it is open at the ends, and the section resembles that shown in Fig. 64. The walls are 3 feet thick below and 2 feet or less above. They incline together

Pl. XXI. Temple of the Sun; from the East.

Four noteworthy features of this structure are the pyramid, some 25 feet in height, the vertical wall with its three doorways, the sloping roof in two zones, and the perforate roof-comb. It is apparent that the middle doorway—much broken down above—is considerably wider than the others. Remnants of stucco figures and glyphs occur on two of the piers. The elaborate stucco designs of the principal roof-zone are imperfectly seen, and those of the roof-comb are nearly all gone save on the west side. Photograph by A. P. Maudslay.



TEMPLE OF THE SUN; FROM THE EAST.

at a slight angle and are connected above by the usual offset arch in miniature. They are perforated in a varied and striking manner and were finished at the top with a slight molding. The masonry is well built of rather small stones set in mortar, and the openings, when close together, are separated and spanned by dressed slabs.

The faces and ends of this strange comb were entirely covered with bold designs in stucco, and it is apparent that it was built for no other purpose than to serve as a framework upon which to model these mythologic tableaux, and to add to the beauty and effect of the building. I have sought to determine the motive that led to the openwork construction. Was it a method of reducing the weight of the wall which, built solid, would greatly increase the strain upon the vaults? Or was it thought that the effect of the openwork behind the sculptures was especially pleasing? The latter is, perhaps, the more reasonable; but there may have been some phase of barbarian ceremony for which the openings were utilized.

The mechanical skill displayed in the construction of these roof-crests is worthy of note. It was not difficult to model the reliefs upon the sloping surface of the roof or on the lower walls, but it would be difficult to fix scaffolding against these roof-combs. It may be that the latticework walls were utilized in this work. It would be easy in building, or in repairing and painting the stucco groups, to place projecting timbers through the openings and attach poles to the ends of these for workmen to stand upon.

As to the manner of attaching the figures and ornaments to the masonry, and building out the relief in plaster, I made particular observations. In other places small stones were set into the wall surface, projecting sufficiently for the attachment and support of the applied work, and the same is true here to a large extent; but much dependence was placed on the strength and adhering properties of the plaster, the stonework skeleton being attached by this means to the framework of the comb. To illustrate the construction, I reproduce, in Fig. 61, a sketch of a partially demolished human figure of colossal size which occupies the middle portion of the comb near the top on the west side. The head, which is nearly gone, was fixed to the cornice and was built up of a number of rough stones to approximate the shape; the features were then modeled over this, and it is probable that ornaments were carried up over the cornice. The neck and body are attached to the upright partition behind, and the arms were supported by the horizontal slabs at points of crossing. Plaster was used to fix the long pieces of stone to the framework and the arms were modeled on these. The strips of stone were shaped

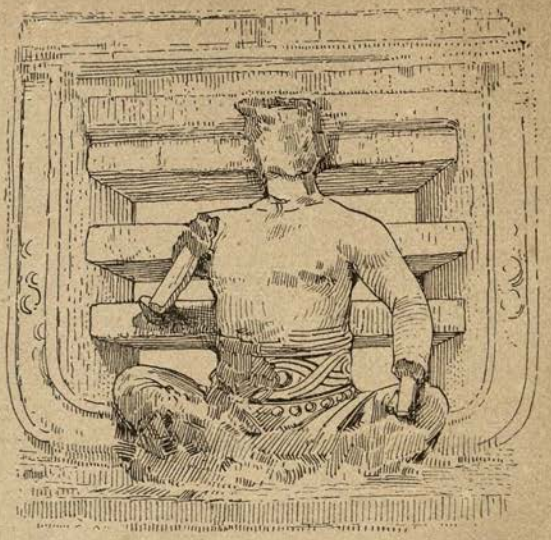


FIG. 61. SKETCH SHOWING MANNER OF BUILDING UP STUCCO FIGURES AGAINST THE OPEN-WORK ROOF-COMB.

for the purpose by sawing up thin slabs of limestone, and one of the pieces is shown in Fig. 62. The appearance of the sawed surfaces indicates that the saw was of primitive form, and there is no reason to suppose it was not made of stone. The body of the figure is partially preserved and displays portions of a tastefully modeled belt and ornaments. The figure is seated cross-legged on the medial course of the comb stonework, and the hands probably rested on the knees. Portions of a neat ornamental framework appear at the sides, passing around the six apertures behind the figure.

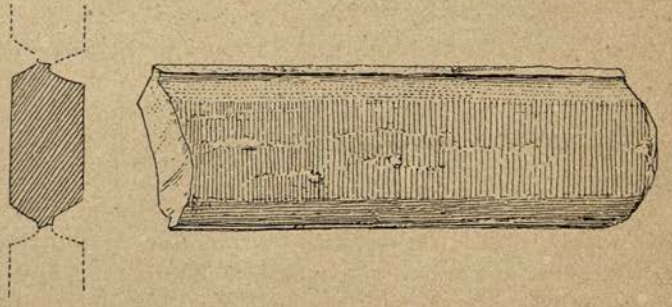


FIG. 62. SAWED STRIP OF LIMESTONE USED IN BUILDING SKELETONS OF STUCCO FIGURES. THE SECTION INDICATES THE SAWING FROM OPPOSITE SIDES. ONE-FOURTH ACTUAL SIZE.

TEMPLE OF THE CROSS. This temple is a prominent feature of Palenque and has received more attention from explorers and writers than any of the other buildings. It appears at the left in the panorama, but as it faces the south only the back and west end are in view. The position and general conformation of the structure are, however, well made out. From the bed of the stream, which is at this point a hundred or more feet wide (though waterless, save in periods of freshet), the supporting terrace rises to the height of 30 or 40 feet and extends back to the foot of the hill, as already described.

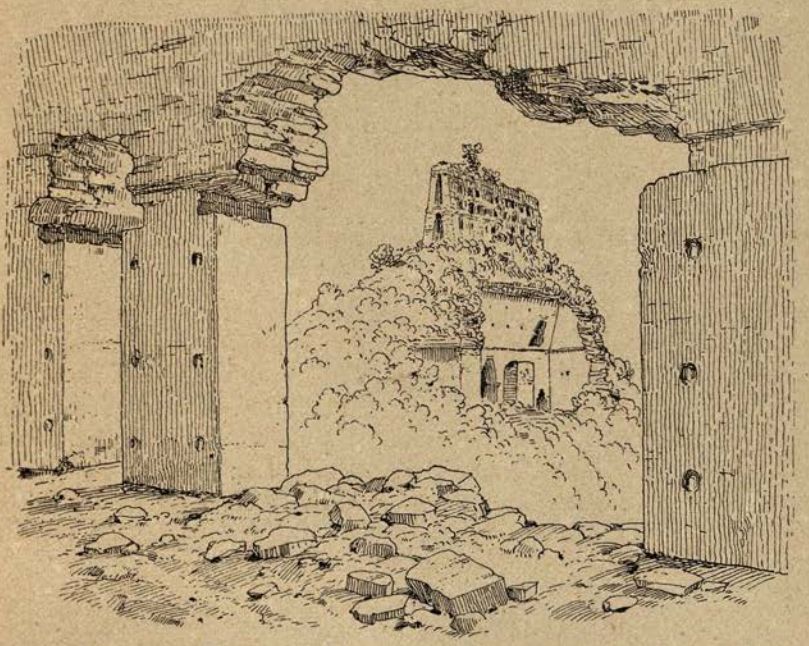


FIG. 63. SKETCH OF TEMPLE OF CROSS FROM TEMPLE OF SUN, SHOWING BROKEN DOWN FRONT OF FORMER.

The pyramid sets back perhaps a hundred feet from the front and rises at a steep angle to the summit, which is barely large enough to accommodate the temple, 31 feet from north to south and 48 feet from east to west. The building faces south 25 degrees west, and thus corresponds closely in orientation with the Temple of the Sun. The surface of the pyramid is entirely buried in debris and covered with dense and tangled undergrowth, and little could be determined of its character. Illustrations given by Stephens indicate a stairway all around. The Temple, including the roof-crest, is about 42 feet high, and is much like the Temple of the Sun in nearly every important

respect. The façade is broken out and, as indicated in a sketch made from the Temple of the Sun, Fig. 63, the back wall of the vestibule, with its soffit slope, doorways and ornamental openings, is exposed. The side walls, or antæ, are broken down to some extent and only one of the two intra-portal pillars remains in place. The exterior walls and roof, save at the front, are well preserved, and the perforated roof-comb, though stripped of its decorations, is almost entire.

The medial wall, separating the outer corridor from the rear gallery, though now fully exposed to the action of the elements, still preserves much of its plaster surface which, as in many other cases, is held in place by coatings of calcareous matter, deposited by percolating water. It is pierced by a great archway 18 or 19 feet in height and a little over 9 feet wide. The walls below are 4 feet 2 inches thick, and at the top of the arch the distance through is 10 or 11 feet. A remarkable feature of this arch, a feature seen also in one or two other temples, is the occurrence of a thin wall connecting the opposite faces of the vault as if to hold them more firmly in place. The lower margin of this wall which may have been supported by a wooden beam extending from side to side, or by an arch, is broken out. This great doorway gives entrance to the sanctuary. At the ends of the medial wall are two smaller doorways, leading to the two lateral chambers behind. These doorways are of usual arched construction and do not reach to the spring of the chamber arch, but above each, in the soffit slope, are sub-trefoil openings, corresponding closely with those in the Palace. They are 5 or 6 feet wide at the base and about 6 feet high. The vestibule walls have the usual beam holes above, cord holders at the offset of the vault and at the sides of the doorways, square openings between the doorways, and tau-shaped perforations in the end walls.

An examination of the remnants of pillars and antæ fronts show that they were decorated with stucco reliefs, as in other buildings. The vestibule extends the full length of the building, and its vault is about 9 feet wide and 20 feet high. The walls are of usual thickness and construction, as indicated in the accompanying section, Fig. 64.

The rear vault is divided into a long middle chamber and two narrow lateral chambers. The latter are entirely plain, save for tau openings, while the former contains the tablet room built against the back wall and arched and roofed as are the buildings proper (see section). The doorway of the room is broken out above thus destroying all but the outer extremities of the stucco devices that decorated the entablature. The spaces at the sides of the doorway

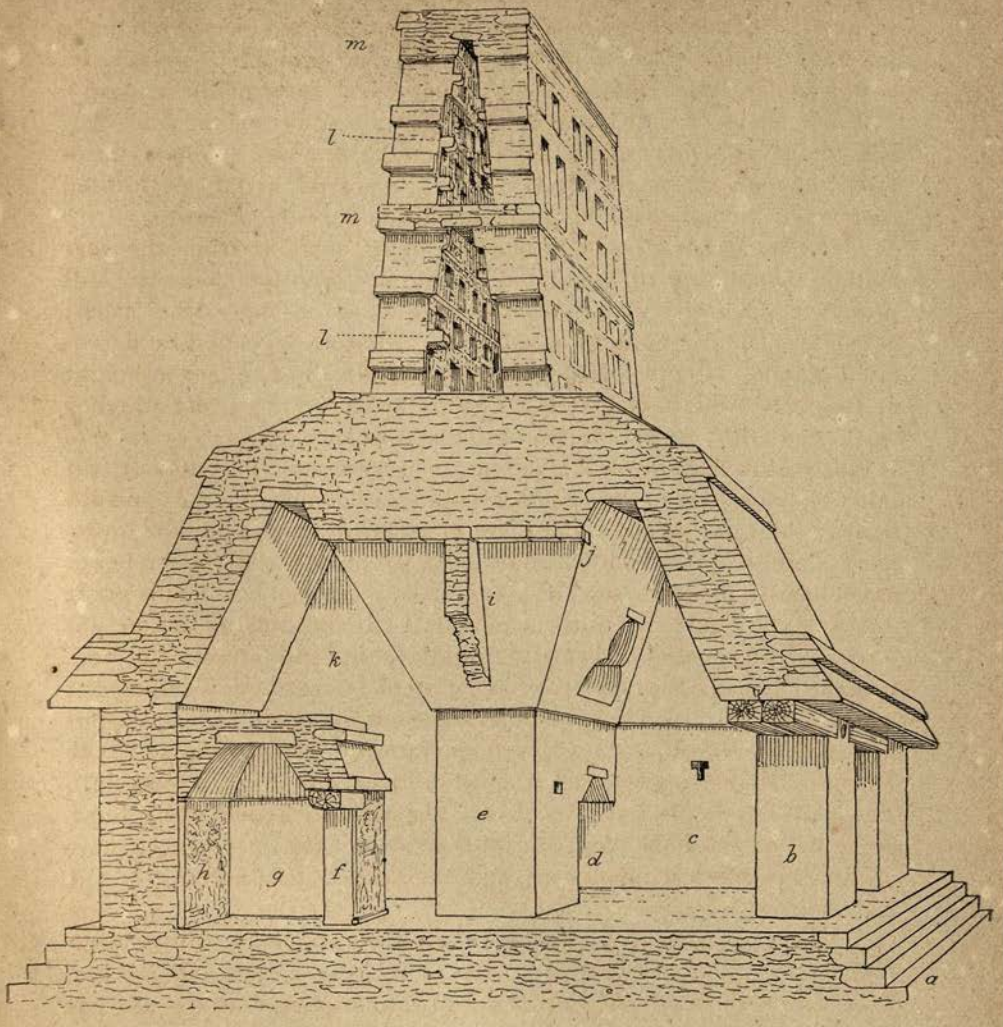


FIG. 64. TRANSVERSE SECTION THROUGH MIDDLE OF TEMPLE OF THE CROSS, SHOWING PERSPECTIVE OF EAST HALF OF BUILDING.

The wooden lintels and portions of the facade are restored.

a. Stairway facing south.
b. Pillar (restored) separating middle and east entrance.
c. East end of front vault or vestibule.
d. Doorway to east anteroom.
e. Great doorway connecting front and back vaults.
f. Doorway to tablet chamber, lintel restored.
g. East wall of tablet chamber.
h. Former position of tablet of the Cross.
i. Arch brace of masonry.
j. Ceiling stones of doorway arch.
k. Partition wall separating sanctuary from east anteroom.
l. Steps (projecting stones) for ascending through openings in middle floor and roof.
m, *m*. Middle floor and roof of comb.

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show the roughened plaster beds from which the two sculptured tablets, probably those now set in the church wall at Santo Domingo del Palenque, were torn away.

The back wall in like manner indicates the position of the tablet of the Cross, now preserved, the main part in the Museo Nacional, Mexico, and the smaller section in the National Museum at Washington. The floor space of the tablet room is 6 by 10 feet. The height of the walls is 6 feet 3 inches, and of the vault—which inclines inward on all sides, and with a very slight curve—is 8 feet 10 inches.

The profile of the roof of this building is seen in the section, Fig. 64. The lower cornice (the eaves) is very bold, projecting 24 inches on the under side, and consists of two members both sloping backward on the outer face with the pitch of the roof. The lower roof space slopes (approximately) with the vault within and shows traces of rich stucco decoration. The upper molding and the roof slope above are narrow, and a level space, 18 inches wide, surrounds the base of the roof-comb.

The roof-comb is a most striking feature, and, when covered with its intricate and elegant stucco designs, must have presented a most unique and attractive appearance. It is 8 feet wide at the base, 36 feet long, 18 feet high, and 6 feet wide at the top. The walls are from 2 feet to 2 feet 6 inches thick and inclose two narrow galleries, of usual construction and profile, one above the other and extending the full length of the comb. The ends are open. The walls are perforated in a much varied manner and served to support the decorations which were fixed to them, as in the Temple of the Sun already described. The accompanying section shows the character of the masonry and profile, and indicates the position of a number of projecting stone steps, by means of which it is possible to ascend through square openings in floor and roof masonry to the level roof. The lattice wall is carefully built, for the most part of small stones, though large slabs are used where necessary as sides and lintels to the openings. The corners are rounded and surfaces are generally covered with plaster which has a light salmon-gray hue.

TEMPLE OF THE CERRO. This ruin was called the Temple of the Cross No. 2 by Charnay, for the reason that it contains a superb tablet quite perfect in every particular and nearly identical with that of the Temple of the Cross. It is in a somewhat more advanced state of demolition than the better known temple, and is placed against the base of the cerro or hill a little beyond that temple and facing the Temple of the Sun.

It is seen in the panorama almost behind the Temple of the

SANCTUARY TABLET WITH SCULPTURES IN LOW RELIEF. TEMPLE OF THE SUN.

Cross. The pyramid is perhaps 25 feet high on the front and is set against the hill so that there is no depression behind. The façade, which faces west 35 to 40 degrees north, is broken down so completely that no traces of the pillars or antæ remain, though portions of the end walls still stand, and the back wall of the vestibule—the medial wall of the building—is complete. The length is 42 feet and the width was from 30 to 33 feet. The ground plan is essentially the same as in the other members of the group and the walls correspond in thickness, masonry and finish. The exterior openings were doubtless three in number, and the doorways into the back vault are the same as in the Temple of the Cross. The doorway at the left has been reduced in size by adding a thin masonry jamb at the right, and a second jamb has been built out from the opposite side of the passage, just within the chamber, thus giving a narrow and crooked entrance. Tau openings, cord holders and beam sockets occur as usual. The trefoil openings in the medial wall are present, but differ somewhat in shape from other examples, the upper part being more constricted laterally. The back vault is divided into the sanctuary and two narrow side rooms. The tablet room within the sanctuary corresponds closely with that of the Temple of the Cross; the decorated entablature is broken down in the same way, and the tablets that formerly faced the lateral piers or antæ have been removed. The roof of this temple is considerably broken down and only the base of the roof-comb remains.

Beyond this temple to the south, and set in like manner against the base of the cerro, are several other ruins the superstructures of which are almost wholly destroyed.

Before passing on I may mention the occurrence of a considerable pile of ruins situated near the margin of the terrace in front of the Temple of the Cross and just north of the Temple of the Sun. It seems to have comprised two or three somewhat independent structures, and traces of walls are visible.

In Pl. XXII I present an illustration of the sanctuary tablet of the Temple of the Sun. It is copied from a Charnay cast, now in the Museum, but it does scant justice to the original work. In design and execution this specimen is not equal to the two tablets of the Cross but it will serve to indicate the general style of the work. The figures of priests are in good proportion and the lines are refined and expressive, but the action is less free than in some of the stucco groups of the palace pier fronts.

SUBTERRANEAN WATERWAY. This is one of the unique features of the ancient city, and its construction was an undertaking of no little

magnitude. The stream in the dry season is hardly more than a playful, sparkling brook, but in the wet season it must become a formidable torrent, a fact well attested by the numerous channels over which it spreads during the torrential period when the waters fail to find their way into the aqueduct at the upper end. A motive for the building of this tunnel is found in the fact that the stream must have been destructive to the terraces on which the buildings stand and to such other constructions as happened to be located near its banks. Perhaps an equally satisfactory motive may be found in the circumstance that during periods of high water free communication between the Palace and the various temples to the east—probably a matter of great consequence—would have been seriously interfered with. The upper end is now clogged and entirely hidden by stones, but the indications are that the opening was a little below the Temple of the Beau Relief. At this point the stream disappears gradually through its bed and issues again from the lower end of the arched way at a point almost even with the north end of the Palace (see panorama) and about 100 feet to the east of it. Below this it rattles down its steep, rocky bed, passing for a hundred feet or more between remnants of cyclopean appearing walls. The archway, a section of which appears in Fig. 65, is, as it stands to-day, some 500 or 600 feet in length. Throughout all this distance the stream was formerly hidden from view, and is now hidden in the dry season.

There has been some discussion as to the course of this arched way, and I entered it from below to make observations. Compass bearings were taken to a point where light streamed in from above, and by duplicating these observations on the surface the opening was located opposite the middle of the east base of the Palace pyramid and only 10 or 15 feet away (T, Fig. 49). The surface torrents have here torn a ragged hole in the ground to a depth of 4 or 5 feet, exposing the heavy slabs that cover the archway and displacing two or three in such a way that an opening is made nearly large enough for a man to enter, and below, at a depth of some 6 feet, the rushing waters can be seen. If the direction continues as at this opening for 20 or 30 feet, the vault passes under the margin of the terrace, and possibly, farther on, it may pass beneath the corner of the Palace. It is not wholly improbable that a passageway may some day be found descending from the interior of one of the southern buildings to the water. I regard it as likely, however, that the arched way was built to get rid of the torrential action of the stream rather than to secure a secret means of water supply. The course of the channel is indicated approximately on the accompanying map and in Fig. 49.

The arch is well built of irregular stones, often of large size, and is founded on the solid but uneven limestone surface. The walls are fairly even; the arch is of the usual type, and at intervals of 30 or 40 feet stone beams are set across, as shown in the section. The height at the lower end is about 10 feet and the width 7 feet, while the depth of the roof from the surface of the ground is from 4 feet to 6 or more.

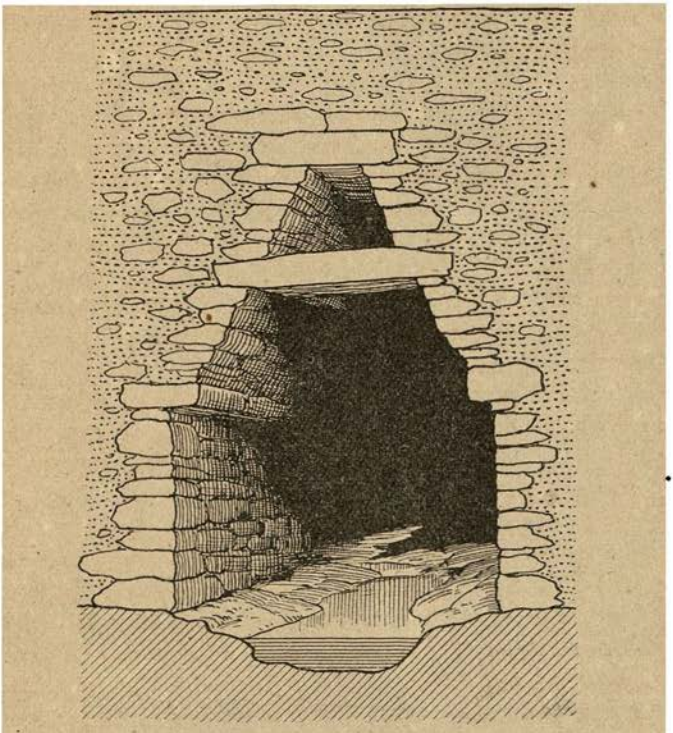


FIG. 65. SECTION OF WATERWAY ARCH. HEIGHT 10 FEET.

THE BRIDGE. The existence of a bridge over the Otolum has been noticed by several authors. It is located some 700 feet below the Palace pyramid and is upwards of 30 feet wide and about 40 feet long. The construction is apparently the same as in the long waterway, and indeed the latter may be regarded simply as a wide bridge, the upper end of which has been choked up by debris. The published illustration of the arch employed in the lower bridge (Bancroft, Vol. IV, p. 343) conveys a wrong impression of its character, representing as it does only the upper part of the vault, the lower part having been obscured by a pool of water backed up from a dam of calcareous tufa.

The full arch would, without doubt, almost exactly duplicate that of the long tunnel (Fig. 65), as well as that of the buildings of Palenque. The stones are better cut and laid in this arch than in that of the waterway above because they represent the original facing of the structure, whereas in the other case the opening, probably originally faced in like manner, has been destroyed by floods. In the illustration, Fig. 66 (upper part from Bancroft, lower part restored), the curve or sag of the soffit lines has been so exaggerated as to suggest a new type of structure.

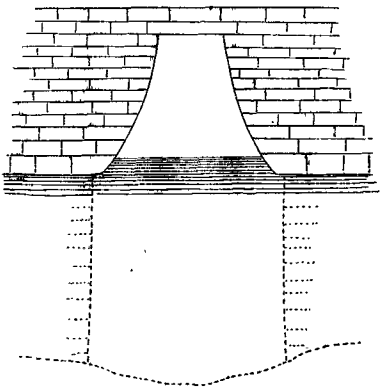


FIG. 66. BRIDGE ARCH INDICATING PROBABLE CHARACTER OF SUBMERGED PORTION.

TOMBS. The evidence is sufficiently strong that the pyramids and buildings of Palenque were devoted in some measure to mortuary uses, and this, too, by the original builders. Such use would appear, however, to be secondary if, as we are in the habit of assuming, the temples were the sanctuaries of deities, about and in which the various rites and ceremonies of worship were carried on. Yet the discovery by Del Rio of evidences of a burial beneath the sanctuary floor of the Temple of the Cross and of similar evidences by Waldeck in a gallery in what he calls the Temple of the Palace, suggests the possibility that the whole structure in such cases may have been erected to do honor to some ruler or religious official whose remains occupied a vault in the body of the pyramid or were consigned to the spot over which the inner sanctuary was erected. It was customary, evidently to build small tombs in the sides of the pyramids as it was also in Yucatan on the north and Oaxaca in the west. Speculations as to the relation of these mortuary uses to the main, original function of the structure are, however, of little avail, and I will only pause to refer to the results of our excavations in the pyramid of the Temple of the Cross. The position of what was believed to be a

ARTICLES FROM A TOMB IN THE SIDE OF THE PYRAMID OF THE TEMPLE OF THE CROSS.
LENGTH OF FIGURE 7 INCHES.

tomb was pointed out by Mr. Herman Collier of Santo Domingo del Palenque, and Mr. Thompson spent the best part of two days clearing out the small, much disturbed chamber, finding traces of burials, and recovering a very interesting set of votive objects and articles of personal ornament, illustrated in part in Pl. XXIII. Mr. Thompson's notes on his work are as follows:

"South 60 degrees west of the façade and about two-thirds down the western slope of the pyramid are traces of a number of tombs. The changes of time and the elements have left these tombs buried beneath the general debris but yet quite near the surface; so near in fact that the mere clearing away of the superincumbent vegetable mold reveals the broken stone slabs that once formed part of the chamber walls or roof.

"The row of tombs examined seems to have been placed parallel with the line of the façade of the temple, and my idea is that when the mound is explored in a thorough manner it will be found that there were several tiers of tombs and that they existed on more than one side of the mound. I got this idea as I waded through the vegetable mold, by seeing the familiar fragments of burial cases (stone slabs) on other sides of the pyramid and also above the tier of tombs encountered.

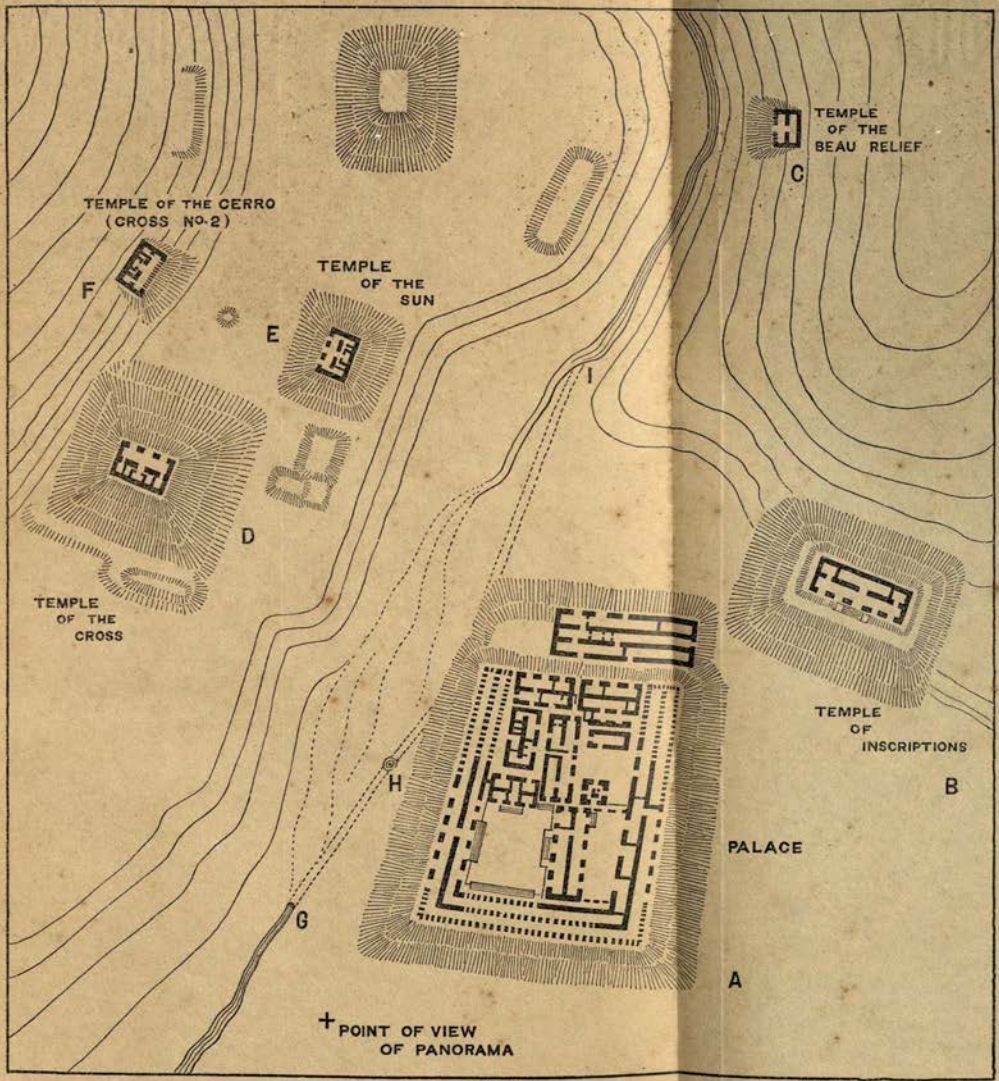
"The tomb examined was built into the side of the pyramid and formed a rectangular room 6 feet 8 inches long by 6 feet wide and 7 feet high. It was well built of lime material and stones and had the appearance of having been once smooth-finished with white stucco. Of this stucco hardly a vestige now remains in place, but the floor of the tomb was covered with its finely comminuted fragments. The roof was vaulted with that form of the corbel vault known as the Maya arch. In the center of the tomb was a rectangular, stone burial-case, 5 feet long, 2 feet wide and 1½ feet high, each side of which was formed of two smooth-finished stone slabs, each 2 inches thick. The inner slabs were sunken below the edges of the outer sufficiently to allow the slab that served as a cover to be let down flush with the edges, thus forming a complete though simple depository for the dead.

"The top of the burial-case was covered with debris that time and dampness had hardened into a compact mass. Carefully clearing off this adherent material I found upon the exposed surface the votive offerings of the ancient mourners, consisting of a small broken terra-cotta effigy and various articles of personal use. As indicated by the position of the fragments, the terra-cottas had been broken purposely before being placed within the tomb, an ancient custom that prevailed to some extent also in Yucatan.

"Lifting the heavy top I found the remains of two skeletons, but so utterly decomposed that a touch destroyed them. One was lying upon its side with arms and knees drawn up toward the chin. The other was so nearly obliterated by the action of water entering through joints opened in the case by some disturbance of the pyramid base, that its exact position could not be ascertained."

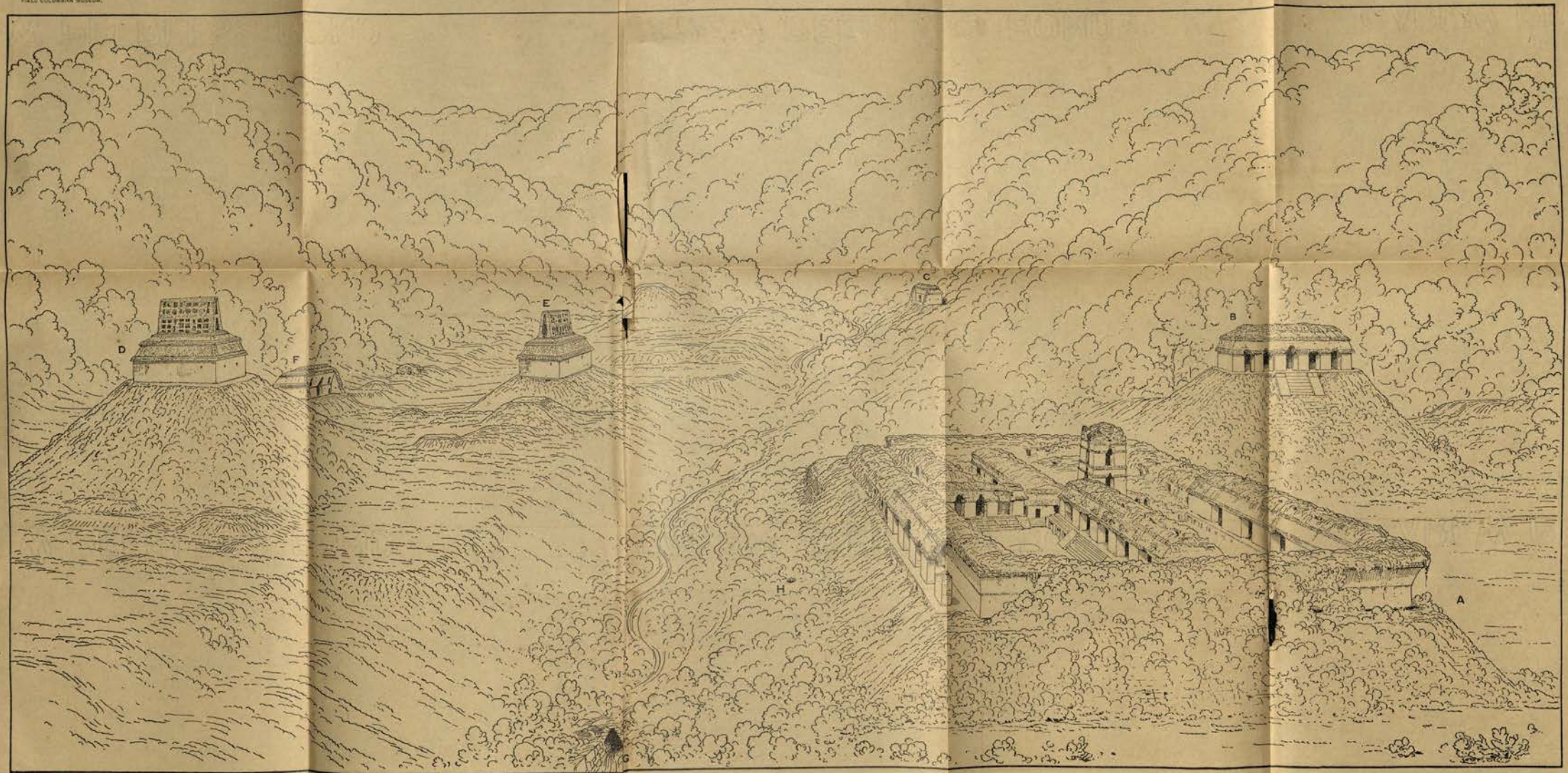
The principal object recovered is a little terra-cotta figure, the arms and feet of which have disappeared. It is strongly modeled in yellowish clay, the surface of the front having received a coat of red paint. The style of work is decidedly characteristic of Palenque; the skull is represented as flattened to an extraordinary degree, and the upper part of the nose and the space between the brows is elevated into a vertical ridge which possibly represents an attached ornament such as is seen in some of the mural reliefs and in the limestone tablets. There is a picturesque head-dress composed apparently of flowing feathers, a necklace of beads and large ear-disks; on the surfaces of the latter are distinctly seen imprints of the finger tips of the potter. The body is decked in a loin cloth looped at the left side and falling in front in the usual manner. Along with the figure were a number of greenstone beads—probably of jadeite, and a spindle whorl, or bead, of ornamental design and excellent finish, in the same material. In addition there were lance heads, a large, rudely finished bone bead, a small and exceptionally perfect obsidian flake knife and some bits of well shaped and neatly finished earthen cups.

CALCAREOUS DEPOSITS. I have already referred to the remarkable calcareous deposits in the Palenque buildings and in the channel of the Otolum. The climate is wet, and during the long rainy season water is constantly penetrating the massive limestone masonry of the buildings, dissolving the lime and depositing it in sheets over the walls and in patches and conical masses on the floors. The wall surfaces, the ornaments, and for that matter the walls themselves, have thus been preserved much more completely than would otherwise have been the case; but the most remarkable phenomena of this class are the deposits in the channel of the creek below the ruins. For quite a distance, as we descend the steep trails from Palenque, the sound of cascades is heard filling the forest with plaintive music. The waters of the stream, flowing down through the forests, become charged with vegetable acids and dissolve the limestones over which they pass. The calcareous matter thus taken up is deposited again farther down, where extended cascades furnish the conditions necessary to precipitation. Innumerable pools are formed, the margins of which are built up little by little until the water turns to one side, building



SKETCH MAP OF PALENQUE.

SCALE ABOUT 100 FT. TO THE INCH.



A. Palace. B. Temple of the Inscriptions. C. Temple of the Bas Relief. D. Temple of the Cross. E. Temple of the Sun. F. Temple of the Cerro. G. Opening of Waterway. H. Walled Opening into Waterway. I. Upper End of Waterway.

PANORAMIC VIEW OF PALENQUE.
LOOKING SOUTH.

other basins which are deserted in turn, and the wide channel thus becomes a succession of terraces, often very attractive in appearance. So abundant is the calcareous matter held in solution that everything touched is coated. The trees are overwhelmed and die; the stones in the stream beds grow into round masses and join one to another in solid bodies; nuts and shells and all hard objects are encased and become the nuclei of rounded stones. I picked up numerous roundish pebbles and globular masses and on my return, suspecting their true character, had them sawed in two to find at the center (Fig. 67) generally a land shell of the Bulimus family which is very plentiful in these forests.

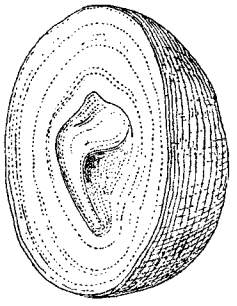


FIG. 67. SECTION OF CALCAREOUS NODULE CONTAINING BULIMUS SHELL.

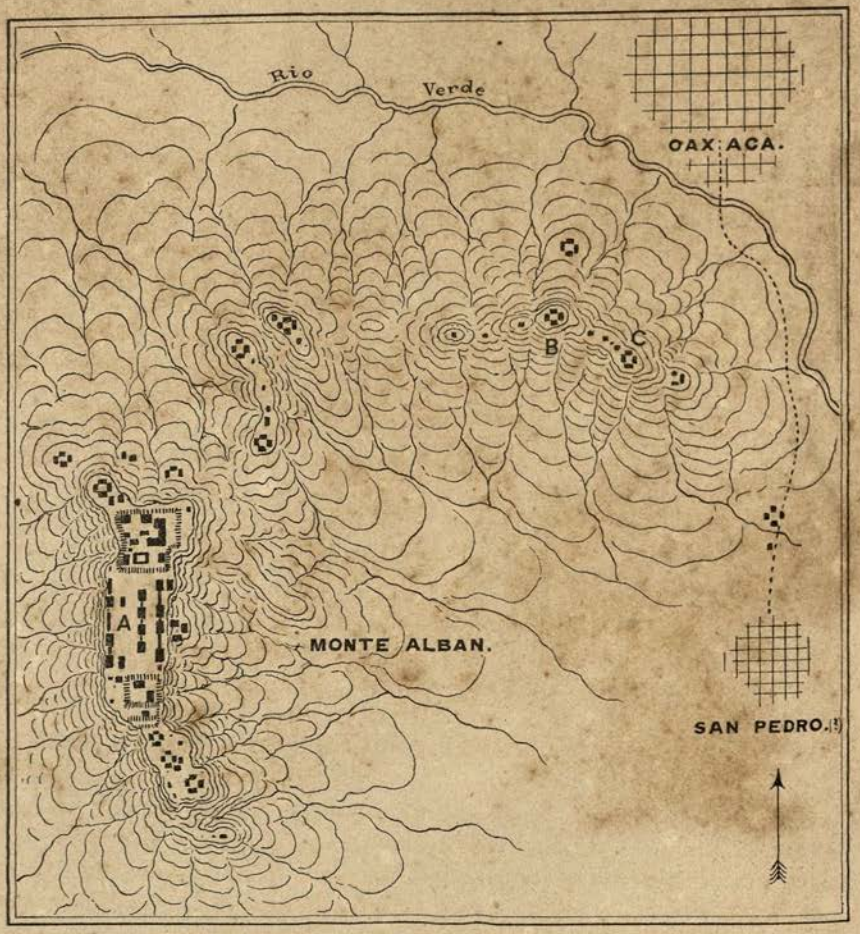


FIG. 68. SKETCH MAP OF MONTE ALBAN AND VICINITY.

Scale about 1 mile to an inch.

A. Great plaza occupying middle portion of the main summit of Monte Alban; north and south of this are the two pyramid-crowned terraces (see Pl. XXVI).

B. Crest of the Lesser Alban. The summit quadrangle appears in Fig. 68.

C. Outer quadrangle of the lesser ridge from which the panorama, Pl. XXVI, was made.

RUINS OF OAXACA.

INTRODUCTORY. Until very recent years the State of Oaxaca remained much isolated from the world at large, but the building of the Mexican Southern Railway has changed all this, and now the section is frequently visited by students who find a fresh and fascinating field for investigation. The principal occupants of the Oaxacan region in ancient times were known as Zapotecs and Miztecs, and the population to-day is made up largely of their descendants, who have in a shiftless, squalid way adopted more or less fully the habits of life and arts of the whites. The native culture of these peoples is thought to have been influenced somewhat decidedly by that of the Nahuatl race to the north; but in many respects their art is strongly individualized, and the building arts, metal work and ceramics, on which the archeologist must chiefly rely, are remarkable for the originality of many of their features. It is also to be noted that within Oaxaca there are very decided differences in the art remains of the different sections, thus bespeaking a localization of cultures and peoples, due in some measure no doubt to the pronounced and varied physical characters of a country abounding in great valleys separated by lofty ridges and almost impassable mountain ranges.

The city of Oaxaca, which has a population of some 30,000 souls, is 150 miles south of Vera Cruz and 30 or 40 miles south of the continental divide. It occupies the mountain bordered valley in which the Rio Verde takes its rise. This stream, after passing Oaxaca, flows 50 miles south, 50 west, and then 40 or 50 miles south again into the Pacific Ocean.

About Oaxaca many of the important architectural remains are found on the mountain tops, and one soon comes to recognize the notched profiles of the ridges and peaks that border the valley as being due to the strangely directed enterprise of the ancient inhabitants. The feeling of surprise induced by this discovery is followed by one of amazement as the real nature and extent of the work dawns upon the mind. As the explorer climbs the slopes and picks his way from summit to summit, he is fairly dazed by the vast array of pyramids and terraces, which not only crown the heights but overspread

the steep slopes, destroying traces of natural contour and making the mountains actual works of art.* From the massive ramparts of these mountain cities one gazes down into the blue and distant valleys, where the present cities and towns appear as mere patches of white and pink set in fringes of green. My hurriedly made panoramic sketches will aid these brief descriptions in conveying a definite notion of the country and the ruins.

Aside from these highland cities there were doubtless many lowland towns belonging to the same period, but cultivation and modern building have greatly accelerated their destruction. There are numerous mounds in the valley about Oaxaca which, though much reduced in height and changed from the original form, show the same general characters and arrangement as do the mountain remains.

RUINS OF THE LESSER ALBAN.

From the roof of my hotel in Oaxaca, with Volume IV of Bancroft's great work in my hands, I scanned the surrounding highlands with the hope of identifying Monte Alban, the fortified mountain said to lie to the westward of the city from half a mile to five miles away according to the estimate of various explorers. There rose to the south and beyond the river the hazy face of a mountainous ridge with uneven profile, that would answer the descriptions given sufficiently well, but there were no signs by which it could be identified as Monte Alban—the white mountain. There were other ranges to the right and left, and just behind the front ridge appeared the summits of a lofty profile that seemed to be many miles away. I noted the front ridge which rises from the bank of the river just south of the town and a mile or more away, first in a gentle slope to a slight shoulder on which were mound-like humps, and then again by a steeper incline to the main crest. Beyond this with various risings and fallings it extends off toward the west, apparently connecting with the highland behind. The face toward the city is very steep and uniform, broken only by inferior, rib-like ridges and shallow gullies which extend from the crest to the base. The slopes are for the most part bare and altogether parched, being diversified only by occasional patches of scrubby trees clinging to the more rugged portions of the surface. I resolved to climb this ridge and take a survey of the region. Its crest is at B, on the accompanying map, Fig. 68.

*The recent discoveries of Mr. Wm. Nevin in the adjoining state of Guerrero, directly west of Monte Alban, indicate the continuance or repetition of remains of the peculiar character here described. Many square miles of the crests and slopes of the mountains are buried in the ruins of dwellings and temples.

It was late in the afternoon when I crossed the river, picking my way along the crowded highway where I was tempted to tarry among the picturesque horde of native men, women and children, on their way to market, some on foot, others astride donkeys with great paniers filled with no end of farm produce and marketable wares; and others in wonderful carts with strangely yoked steers and marvelous loads — the whole affording more picturesque subjects for camera and painter's brush than I had ever seen.

Crossing the river, now carrying but little water, I reached the east end of the mountain ridge half-a-mile beyond, and turning to the right out of the road began the ascent. At an elevation of some 300 feet the first break in the profile was reached—an abrupt shoulder, nearly level for a few hundred feet though quite narrow. Here there are numerous traces of ancient occupation, and a group of low mounds occupies the outer point. The principal mound, some 60 feet long and 25 feet wide, stands on the outer margin. Its outer slopes are long, connecting with the mountain incline below, while on the inner side it is not more than 10 feet high. It has undoubtedly been the substructure of a building, and the margins of a cement floor outcrop from the sides near the crest. Standing on this pile and facing the mountain, we observe a depressed space a hundred feet square bordered by a second mound on the north and low ridges on the south and west; next this is a flattish space, some 80 or 90 feet wide, and beyond still a succession of low, narrow terraces terminating against the rocky rise that leads to the summit. It is clear that the four outer mounds are the remnants of structures arranged about a court forming a quadrangle, but every part, save the two principal piles, has long been under cultivation, and it is hard to say just what part of the terracing, everywhere visible about the mounds and extending down the slopes and occupying every available bit of space around the precipitous faces of the mountain, is of the ancient time; but that the work is in the main prehistoric is fully shown by the almost universal presence of broken earthenware, the gray, elaborately modeled figure vases so characteristic of Zapotec culture prevailing to a large extent.

Leaving the shoulder and its dessicated garden beds, I passed up the rocky incline some 400 feet to the summit, which I found surrounded by terraces and crowned by ruins. A well preserved quadrangle occupies the outer point (in the foreground of the panorama, Pl. XXVI), and from the outer pyramid a superb view is obtained of the valley and its cities and towns spread out below. The superstructures are entirely removed from the oblong mounds, which appear to have been from 12 to 20 feet in height, 60 or 70 feet long, and

20 or 30 feet wide—summit measurement—and inclose a depressed area fully 100 feet square. The mounds are well rounded and much broken down; and in places where the hearting is exposed it is seen to consist of stones and earth somewhat irregularly thrown together. At the surface some system was observed in laying up the stones, and traces of cement floors are seen about the summits. From the outer mound several terraces extend down the slope, but the sides of the ridge are steep and rocky.

Turning to the west we look along the ridge and observe its somewhat sinuous and uneven crest (see panorama), and find that every part is occupied by ruins and terraces, the rounded mounds arranged in quadrangles crowning all the prominences. The crest is narrow, rarely exceeding 100 feet in width, and its level spaces are shaped into a series of rude terraces which rise and fall with the profile; all of these are now under cultivation, the industrious natives scratching up every available square rod of the rocky soil to plant their corn. A slight spur of the ridge extends out toward the city and terminates a few hundred feet below in a shoulder like that encountered at the east end; this is occupied by remnants of buildings in the usual quadrangular arrangement.

The appearance of this ruin-covered ridge, as seen from the outer mound, is shown in the accompanying panorama, Pl. XXVI. The crest extends a mile away to the west, connecting by a low saddle with a great mountain crest beyond. This latter mountain, at the nearest point nearly two miles away, was readily recognized as the true Monte Alban, and I was much impressed with its grandeur, the effect of height being greatly enhanced by the hazy condition of the atmosphere. The summit appeared strangely serrated, but at first it did not occur to me that these irregularities were due to the system of artificial structures with which it is crowned.

In making the sketch for the panorama I assumed a point of view that would bring the quadrangle of the east end of the near crest—the Lesser Alban as it is called for convenience—in the foreground. The river appears at the base of the slope at the right and on its farther bank are the upper suburbs of the city, while beyond are the lofty summits of the continental divide; and extending to the northwest is the valley along which the railway descends to the city.

Following the crest toward the west, traces of several structures were encountered, and on the first high summit, some 2,000 feet from the outer end, stands the best preserved ruin of the series (G). It consists of the remains of four structures occupying the entire crest, and inclosing a court in the center of which is a pile of debris mark-

ing the site of a shrine. The lateral pair are mere ridges representing oblong structures that once overlooked the steep mountain sides; while the crosswise pair are quite bold in outline, the summits measuring some 60 feet in length and 20 feet in width. These mounds (Fig. 69) have been dug into by explorers or treasure hunters and are of the usual composition, with traces of cement floors at several levels. Though occupying these irregular mountain crests the buildings have as a rule been oriented with much care.

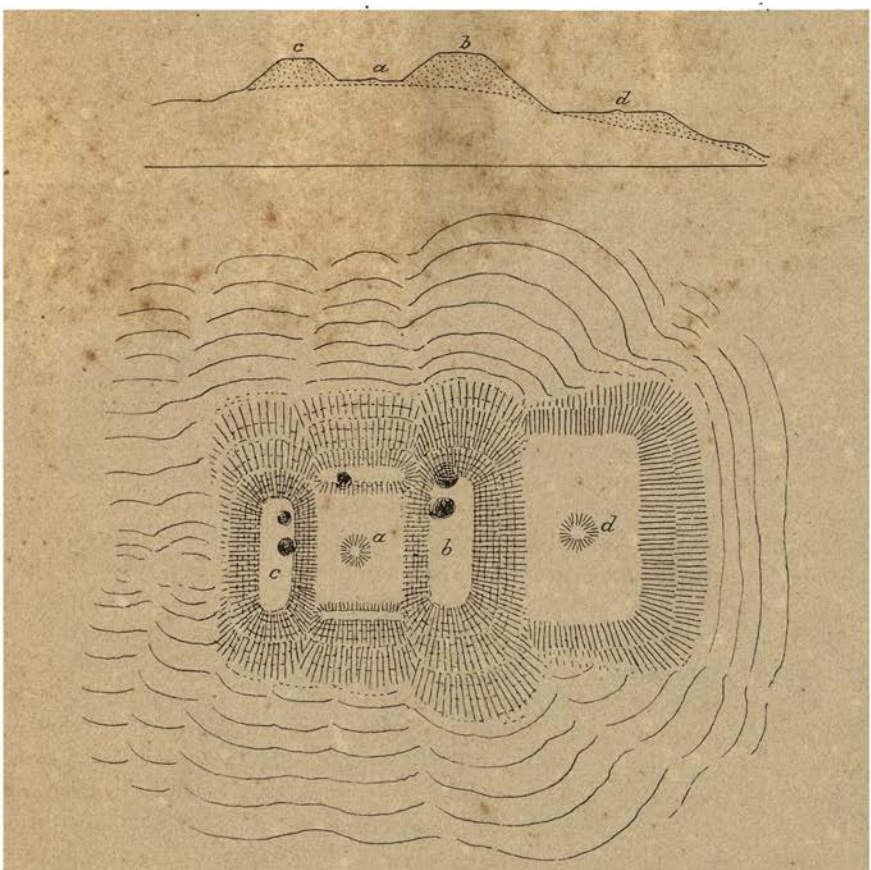


FIG. 69. CREST QUADRANGLE OF THE LESSER ALBAN.

a. Court with traces of central shrine (?).
b. Eastern mound or pyramid with excavation pits.
c. Western mound.
d. Terrace with central knoll.

Extending out from the base of the eastern mound is a terrace nearly a hundred feet square, in the middle of which is a small conical mound. The mountain slopes are very steep at the sides, as

indicated in the panorama. Westward of this group there are but slight traces of ancient buildings. There is one deep saddle affording a wide flattish space which has a few low mounds. This spot has evidently been extensively occupied for dwelling, as the soil is filled with stone implements and remnants of earthen vases; there are also rubbing stones, mortars, hammer-stones and flints. Beyond the saddle is a single summit of conical form, the crest of which is truncated and bears traces of buildings and dwelling. From this point there is a descent of several hundred feet to the pass that partially separates the lesser ridge from an outstanding northeastern spur of Monte Alban—as shown somewhat plainly in the panorama. From the conical summit I returned again along the ridge and reached the city at night-fall.

The eastern end of the ridge exhibits outcroppings of a gnarled limestone which may be of silurian age, but the middle and western parts are composed mainly of quartzites passing apparently into gneisses. The strata seem to dip toward the north at a high angle. The only example of dressed stone seen on this ridge was a mass of limestone, near the east end, which had been leveled off and smoothed near the ground, giving a table-like surface some 5 feet in diameter.

RUINS OF MONTE ALBAN.

The visit to Monte Alban was the most romantic feature of my trip to southern Mexico. Having secured a horse I crossed the river and, passing beyond the end of the ridge already described, soon reached a village called San Pablo; from this point I turned to the right and shaped my course up the gentle slopes toward the middle of Monte Alban which rose as a great wall to the west (see panorama, Pl. XXVI). Turning to the left when near the base of the steeper slopes, I climbed the extreme southern spur of the mountain which is about five miles from the alameda in Oaxaca. I passed up over alternating narrow cultivated terraces and outcropping ledges of limestone; the latter, interbedded with quartzites, form the body of the mountain and dip slightly to the north, the outcrops along the steep sides giving the mountain a peculiar, ribbed effect. On this outer point, seen at the extreme left in the panorama, I began to encounter small mounds, which represent ancient buildings, beside many indications of dwelling. On the second level, 300 or 400 feet higher and but little below the main summit, the first well-preserved quadrangular ruin-group was encountered. It is seen on the sketch map at

H, and consists of four oblong mounds arranged about a court, in the center of which is the usual small conical pile of debris. The northern, southern and western sides are represented by low, rounded ridges of debris, the north ridge being about 8 feet high. The eastern structure is a pyramid, nearly 25 feet high and with steep sides. The main level of the summit is about 40 feet square, and is occupied by a heap of debris representing a superstructure—a house or temple—set back toward the east side. The cement floor is visible at the edges, and traces of stone walls are seen all around. The remnants of what appears to have been a stairway occur on the sides next the court, which is about 100 feet square. This ruin is on a wide cultivated terrace, supported by a succession of inferior terraces encircling the promontory on three sides. Small mound-like remnants of buildings are seen on all hands. Passing over the cornfield to the northwest I reached, at a distance of 500 feet, a second group of mounds that includes one typical quadrangle. The court of the quadrangle is some 80 or 90 feet square, and has the usual low mound in the center. The south member is 20 feet high by 45 feet long and 40 feet wide, and has the ruin of a superstructure—a mere heap of stones—on its summit. The other sides are from 5 to 10 feet high and are rounded ridges representing ruined houses. At the southeast corner of the quadrangle, rises a mound showing considerable loose stone all over its sides. It is a few feet higher than the south member of the quadrangle, which it approximates closely in horizontal dimensions. At the north base is a deep depression separating the east ridge of the quadrangle from a lower ridge at that end. Rising from this at the north there is a terrace about 80 feet square supporting the much reduced remains of a building. The mountain ridge, here quite narrow, falls off rapidly in terraces on both sides. Following the ridge to the north some 300 feet, still over a narrowing field, another quadrangle of usual plan and proportions was observed. The buildings are represented by ridges of stone and earth, which are at no point over 10 feet high.

One hundred feet farther on I ascended the face of a terrace, upwards of 40 feet high, which crosses the ridge at right angles, the left margin following the oblique trend of the mountain side, and the right descending to a marginal terrace which continues north for a long distance on the east side. Crossing this terrace and some low mounds I ascended a second terrace 10 feet high and came in view of the southern member of the great central group of remains. The latter is a pyramid more than 400 feet square and 40 or 45 feet high, supporting two pyramids on its summit. The slopes of this great mass are pre-

cipitous all around and covered with trees and the debris of fallen walls. I climbed the south face by a steep pathway, leading my horse up with much difficulty. From the main level I ascended the central pyramid, which is the crowning feature of this part of the crest, and obtained a magnificent panorama of the mountain and the surrounding valleys and ranges. Turning to the north the view along the crest was bewildering in the extreme. In years of travel and mountain work I had met with many great surprises—such as that experienced on emerging suddenly from the forest-covered plateaus of Arizona into a full view of the Grand Cañon of the Colorado, or of obtaining unexpected glimpses of startling Alpine panoramas—but nothing had ever impressed me so deeply as this. The crest of Alban, one-fourth of a mile wide and extending nearly a mile to the north, lay spread out at my feet. The surface was not covered with scattered and obscure piles of ruins as I had expected, but the whole mountain had been remodeled by the hand of man until not a trace of natural contour remained. There was a vast system of level courts inclosed by successive terraces and bordered by pyramids upon pyramids. Even the sides of the mountain descended in a succession of terraces, and the whole crest, separated by the hazy atmosphere from the dimly seen valleys more than a thousand feet below, and isolated completely from the blue range beyond, seemed suspended in mid air. All was pervaded by a spirit of mystery, solitude and utter desolation not relieved by a sound of life or a single touch of local color. It seemed indeed a phantom city, and separated as it is by half a dozen centuries from the modern city—barely traceable as a fleck of white in the deep valley beyond the saddle of the Lesser Alban—furnishes a tempting field for speculation.

I have endeavored to convey some notion of this remarkable scene in the panorama (Pl. XXVII) which is constructed from a sketch made from the summit of the central pyramid seen in the foreground of the view. The point of view assumed is indicated by a cross in the profile view of the mountain (Pl. XXVI), and also by a cross on the accompanying map (Pl. XXVIII). In the foreground is the great terrace, referred to above, crowned by its two pyramids, one placed at the southeast corner and the other, the main mound, situated a little to the left of the center.

Behind this group is the central feature of the ancient city, a vast court or plaza, a level, sunken field 600 feet wide and 1,000 feet long, inclosed by terraces and pyramids and having a line of four pyramids ranged along its center. The great lines

of mounds at the right and left border the abrupt margins of the mountain, and beyond is the most astonishing feature of all—a broad terrace 600 or more feet square, within which is a sunken court surrounded by numerous pyramids that rise in a culminating group at the distant right. Beyond this at the left are other groups of mounds, and still other groups occupy the spurs and subordinate crests into which the north end of the mountain is broken. At the left and farther away are two independent, rounded, mountain crests crowned by groups of mounds. At the right is the extreme west end of the Lesser Alban, and beyond and far below are caught glimpses of the valley with its villages and farms; and rising beyond this are the lofty ranges of the continental divide, so obscured by the haze of the dry season that their serrate profiles can hardly be made out.

It was three o'clock in the afternoon when I finished the sketch, and when night came on I was in the midst of the great group at the north end, having climbed in the meantime eighteen of the forty or fifty pyramids included in the view, and having made the accompanying sketch map and various drawings both general and detailed. During the day I encountered but one man, who came up over one of the terraces, shook hands and passed on, but managed while my back was turned to skillfully extract a valuable pistol from my saddle. I may add that my horse was of little service, and hindered rather than aided me, so that most of the work was accomplished on foot. Owing to the necessary haste I cannot claim for my drawings and descriptions more than approximate accuracy, though it will be found, I am sure, that they give correct general impressions. In drawing the panorama the mantle of foliage enveloping many of the forms has been largely ignored, and the outlines are given somewhat more firmly than they appear in the reality, yet there is no attempt at restoration.

The group of structures occupying the foreground in the panorama forms the southern member of the great, composite quadrangle of Monte Alban. The substructure is a low truncated, pyramid upwards of 400 feet square at the base, with regular though now slightly broken slopes rising at a steep angle to a height of 40 feet or more. The summit is quite level and approximates 300 feet square.

The pyramid occupying the southeast corner is 80 feet square at the base and perhaps 60 feet square on the summit. The height is about 25 feet, and the outer slopes are nearly continuous with the slopes of the substructure. The presence of piles of debris covering the crest and sides makes it apparent that the building was faced with stone—not dressed, however, as this quartzite is too hard to be cut readily with stone tools.

This pyramid has been extensively tunneled by explorers and treasure hunters; passages have been opened entirely through the base of the pile both from east to west and from north to south, and a great well descends from the center of the summit to the intersection of the tunnels. The walls of these excavations are entirely uneven, presenting no indication of original openings or chambers, notwithstanding the impression given by Dupaix in various illustrations that the galleries pertained to the original construction and were well built and faced with stone. In the sides of the excavations beds and masses of loose stones—now coarse, now mixed with finer materials—alternate with beds and lenticular masses of adobe and cement-like deposits of light color, the latter occurring in cases in such thin and level layers as to suggest successive floor levels.

The central pyramid is not far from 100 feet square at the base, and is 25 or 30 feet high. The sides are steep and but little broken down, and the summit, which is covered by the debris of a building, is something like 50 by 60 feet in extent. This mound has been tunneled from north to south, and its composition is similar to that of the companion structure. The idea of the quadrangle seems to have been in the minds of the builders of these piles; the space to the east of this central mound and north of the corner mound is inclosed on the north by a line of debris, probably representing a building, and in the center is a small mound such as characterize nearly all the courts. A somewhat novel feature of this group is a low ridge of debris about 25 feet wide, and 10 feet high in places, extending along the northern margin of the main terrace. It is interrupted for a short space near the middle (the landing of the stairway perhaps) and is composed largely of stones, portions of a strong stone wall appearing in places.

Descending this massive structure at the northeast corner, I encountered near the base portions of the ancient facing; this consists of large blocks of stone, systematically laid up, on which are seen various bas-relief sculptures. The principal figure exposed to view is a serpent carved in low relief; the head, occupying a block 2 by 3 feet square, is crowned with an elaborate radiating crest, and a long coiled tongue extends from the mouth. The snout is somewhat porcine in character, being rounded and turned up slightly at the point. The style of delineation is entirely distinct from that characterizing representations of the Maya serpent. The rattles of the reptile's tail appear on a neighboring block. The stone—apparently a quartzite—was too difficult to carve to encourage elaboration. These stones have vertical faces, indicating that the pyramids, like those

of other sections, had a series of vertical steps offsetting to the summit. It was while I sketched the serpent's head that the old Indian robber secured my pistol.

At the base of this pile on the east is a terrace some 50 feet wide, which descends the side of the mountain 60 feet or more to be followed by others, and in such abrupt fashion that little can be seen of them from above. Across this first terrace, connecting with the corner of the pyramid, is a massive stone wall 10 feet high and with slightly sloping faces. At this point begins the irregular line of pyramids that connects along the east margin of the mountain serving to inclose the great square on this side. These pyramids are of irregular height and varying horizontal extent, but form a continuous chain, the larger mounds being connected by inferior structures, so that the great inclosure is not open to the mountain brink, save perhaps at the north end, where there is now a passage and a roadway or trail. It is to be noted that these mounds are in a single line, standing on the very brink, and that there was no attempt at assemblage in quadrangles save perhaps at the north end and in a group occupying a subordinate level on the east declivity. There are five principal pyramids in the chain, one near the south end 100 feet from the base of the great southern mound; two closely associated oblong pyramids near the middle of the line, the loftiest having a height of 35 or 40 feet and a length of at least 150 feet; and two others, not widely separated, next the north end. The connecting ridges, shown in the panorama and map, are from 10 to 20 feet in height and 40 or 50 feet in width, and, although somewhat irregular in form, bear evidence of former regularity. It is highly probable that all were neatly and symmetrically finished, and supported a series of imposing buildings. Many of the mounds show traces of mutilation by modern explorers.

The chain of pyramids extending from north to south along the middle of the great square constitutes one of the most interesting features of these remains. They are well shown in the panorama and map. In viewing these works one is tempted to indulge in speculations as to the conditions that must have prevailed during the period of occupation. How striking must have been the effects when these pyramids were all crowned with imposing temples, when the great, level plaza about them, 600 by 1,000 feet in extent, was brilliant with barbaric displays, and the inclosing ranges of terraces and pyramids were occupied by gathered throngs. Civilization has rarely conceived anything in the way of amphitheatric display more extensive and imposing than this.

In this central group there are four pyramids, the northern one standing alone and the others connected by subordinate links. The principal summits are about 23 feet in height, the bases approximate 100 feet square, and the level summits are less than 60 feet square. The third member is somewhat longer from north to south. All present considerable irregularities, due in some cases to debris of fallen structures and in others to modern excavation, and tunnels and pits appear in many places. The slopes are generally steep and covered with scrubby trees. In the south face of the southern mound, as indicated in the panorama, an ancient gallery or tomb-like cham-

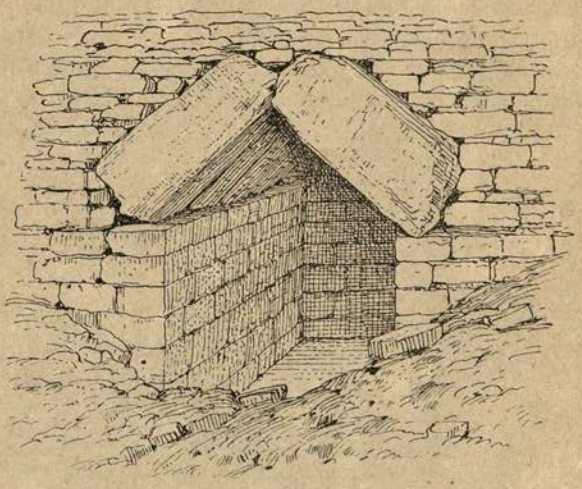


FIG. 70. CHAMBER IN SIDE OF PYRAMID; PROBABLY A TOMB.

The walls are well built of rough dressed stone and the ceiling is formed of massive blocks inclined together at the top. The situation is at *a* in the panorama. Width of chamber 3 feet; whole height about 6 feet.

ber is seen. It is at the left and a little more than half way up the slope. The opening is broken down, and the doorway, if any existed, is entirely removed. The chamber is about 12 feet in length; the lateral and end walls, faced with squarish blocks of slightly hewn stone, are 4 feet high; and the ceiling is formed of large unhewn or partially hewn blocks of stone resting on the lateral walls and leaned together at the top, as shown in the accompanying sketch, Fig. 70. The body of the pyramid, so far as exposed, is composed largely of stone and contains numerous stones of rather large size.

As shown in the panorama the chain of pyramids inclosing the great plaza on the west occupies a wide space and includes two or

three well-developed quadrangles. The various members have been connected pretty closely for the entire length.

The space, from 200 to 400 feet wide, lying between the base of the south-end pyramid and the mountain margin on the west side, is occupied by various works of inferior height, nearly all much reduced by cultivation. These features, as indicated on the map, are separated from the great western range of mounds by a slightly depressed space, 30 or 40 feet wide, which extends from the northwest corner of the south-end pile to the western brink of the mountain.

Rising from this depression on the north is a prominent quadrangular group, consisting of a great pyramid, on the outer side 25 feet high and 60 by 90 feet on the summit; an inferior pyramid on the inner side facing the great square; and two low ridges closing in the court on the north and south. The court is something like 100 feet square, and contains the usual central pile of debris.

FIG. 71. COLOSSAL HEADS IN LOW RELIEF.

The slabs project from the side of a pyramid, near the base, in the southwest corner of the grand plaza; *b* in the panorama. They represent the facing of the structure or the lining of a tomb. Height of heads, 15 inches.

North of the main western mound is a second large mound, 15 or 20 feet high on the inner side and 40 feet high on the west. The summit is much broken by depressions and piles of debris representing ancient structures, and is about 140 feet from north to south and 60 feet from east to west. Between these pyramids is a small mound much mutilated by modern excavation. Here I encountered the remains of another chamber, extending into the corner of the pile near the base, the walls of which are covered, at least along the upper margin, with crude relief sculptures. The roof is formed, as in the other case, of inclined stones of large size. This is probably the chamber in which Dupaix found human bones. Projecting a few inches above the debris I observed the sculptured stones described and illustrated by Dupaix. Figures of men in very low, crude relief occupy

the faces of the rather rough blocks, which are, I believe, of very hard limestone. The head most plainly seen (Fig. 71) is of colossal size, and belongs no doubt to the sitting figure copied by Kingsborough and Bancroft from Dupaix. In style the work is decidedly unlike anything that I have seen elsewhere.

The long mound is followed on the north by a low rounded pile, and this by a third pyramid of average dimensions; and beyond this again is the final member of the series—a low, wide mound much reduced by cultivation. All of these structures line up with the western wall of the mountain, and their outer faces are continuous with a great terrace whose steep face connects with still other artificial steps descending to the precipitous, ribbed mountain wall. The third pyramid forms the outer member of a quadrangle, the east member of which is a low, oblong pile facing the great plaza, while the sides have only obscure ridges.

Ascending the broad terrace front that rises to the north of the great plaza I encountered the most remarkable evidences of the enterprise and taste of the ancient occupants of Monte Alban. The entire mountain summit, varying from 500 to 800 feet in width, is occupied by a vast group of works. The east and west outlines follow approximately the somewhat uneven sides of the crest, and on the north and south the fronts extend in slightly broken lines entirely across from brink to brink. The distance from north to south is some 700 or 800 feet. The outline is approximately indicated on the map which, with the aid of the panorama, will give a fair idea of the varied and interesting character of the structures. Just how much of this great mass is natural and how much is artificial no one can state, but that the entire surface is artificial is apparent, and not only that, but the various sub-terraces, descending from its east and west sides for some distance down the mountain slopes, are also artificial. The several superposed pyramids first catch the eye, but advancing a hundred feet from the southern margin of the terrace a wholly unique feature is encountered; it is a sunken square 100 feet or more in extent and some 20 feet deep, on the level floor of which is a large pile of tree-covered debris, marking a central feature—a shrine or temple. Surrounding the depressed area numerous pyramids rise, some in one and others in two levels. The level spaces—even the bed of the sunken square and the summits of the pyramids—are under cultivation (in the wet season), and the arrangement of depressions and reliefs and the grouping of plain and tree-covered areas, strongly suggest a masterly piece of landscape gardening. At the west end of

spade, hoe and other agricultural tools are hardly less interesting. I brought away several specimens, including the ax and machette shown in Fig. 72.

THE ANCIENT REMAINS. The ruined structures of Mitla are better preserved than those of any other group in Mexico proper, but are not so extensive as are the remains of Monte Alban or San Juan Teotihuacan; neither does it appear that they represent a city comparable in size and importance with these places, or with others in Yucatan and Guatemala. But they are surpassingly interesting and bear out the impression, given by each great site in turn, that the pre-Spanish peoples had developed in certain lines, and especially in the temple building art, far beyond the stage of advancement ascribed by common estimate to the native races.

The art of Mitla, as represented by the architectural remains, was highly individualized and hence presents many novel features—a result due in large part, no doubt, to the isolation of the people and the peculiarities of their environment. Many features of plan, profile, construction and finish are new to the student who has paid attention chiefly to Nahua and Maya building, and the system of embellishment seems to stand alone, even in the province to which it belongs. The mural decorations are purely geometric, and in appearance are in striking contrast with the mythological, life-form designs so prevalent throughout other sections of Mexico. Much has been said by various authors regarding the significance of these and other peculiarities of the architecture, and some have predicated upon them marked distinctions of race, but such characters of art, standing alone, have no great value as ethnic criteria.

With respect to the mechanical perfection of Mitlan work in stone, it may be said that environment probably had much to do with it. The trachytes that surround Mitla break down in great blocks along the cliffs and are the most tractable and easily manipulated of the building stones. Monte Alban furnished nothing but flinty quartzite and gnarled crystalline limestone; San Juan Teotihuacan had mainly the most intractable forms of basaltic lavas. Such rocks do not lend themselves to the pick of the quarryman and the chisel of the sculptor, otherwise these two cities would probably have contained examples of architectural achievement unequaled in America. Mitla is what it is largely because of the presence of inexhaustible supplies of superb and easily worked building stone—the soft, massive, yet tough and durable, trachytes.

Mitla has been described in recent years by a number of visitors, including Charnay and Bandelier, but it has not been adequately

explored by anyone, and even the visible features have been but meagerly presented to the world. Although my own studies here were more full and careful than in the other cities, I cannot hope to cover the whole ground. Bancroft* has reviewed the literature of the site, and Bandelier† has discussed the people as well as the literature, and has published elaborate measurements and descriptions of the buildings. Charnay‡ gave to the world a superb series of photographs, but has published few original observations. I shall give first attention to the presentation of a panoramic view and then take up in some detail matters pertaining to construction and decorative elaboration, and to the quarrying and cutting of stone.

PANORAMIC VIEW. The situation of Mitla is such that a point of view comprehending even the main structures in a satisfactory manner, is difficult to secure. The mountains are too far away to furnish points of observation, and the bluff, which rises just back of the ruins on the north side, is so situated that from it the buildings have a tame and squatty look; and the colors of the stonework, all somber grays and browns, are so blended with the gray adobe plains and russet slopes that no effect of relief or contrast can be obtained. Besides this the village and its clusters of dark foliage are spread like a veil over the site, obscuring the various remains. Not being able to secure an elevated point that would serve my purpose it became necessary to assume a point of view and construct the panorama. The point selected was a little to the east of the best preserved group of ruins and high enough to display all the groups clearly. In order to secure accuracy, each ruin was studied with great care from every available point, and photographs were made with the same end in view. In the very elongated panoramic view presented in Pl. XXXVIII we look to the west down the valley of the Rio Mitla. The foliage is for the most part omitted, and the whole scene is simplified with the view of bringing the ancient buildings out in better relief. The stream course with its vertical clay banks meanders the site at the left and passes beyond, disappearing between the interlocking terraces which slope up in long monotonous lines to the fine mountain range at the left, and on the right connect with the bold spurs that come forward into the valley from that side.

A conspicuous feature of the landscape is a hill quite isolated from the remainder of the highland and somewhat suggesting—mainly because of its ruins—the Acropolis at Athens. This bears on its

*Native Races, Vol. IV, p. 388.
†Archæological Reconnoissance into Mexico, p. 263.
‡Ancient Cities of America, p. 500.

summit an ancient fortress, the walls of which, and the ruined buildings within, are plainly seen from Mitla with the naked eye. In the distance the valley turns to the right around a lofty ridge, and the blue ranges beyond close the view to the west.

A brief study of the accompanying map, Pl. XXXIX, in conjunction with the panorama, will aid greatly in securing a clear notion of the relation of the buildings to each other and to the site. The point of view for the panorama is indicated by a cross on the map. Five great clusters of buildings are more or less perfectly preserved, and it is possible that others could be traced if excavations were undertaken. The Group of the Catholic Establishment (I), near the bluff on the north side, consists of three coalescent or closely associated quadrangles; the Group of the Columns (II), a little lower down, includes three well preserved quadrangles; the Group of the Arroyo (III), still farther down, comprises three quadrangles; the Adobe Group (IV) to the right of this consists of but one quadrangle; and the South Side Group (V) on the opposite bank of the Rio Mitla, consists of two quadrangles. These structures are all located with approximate accuracy on the accompanying map, Pl. XXXIX.* It is possible that a sixth group was located on the favorable site between the Group of the Columns and the river, and it will not be surprising if foundations of one or more groups are at some future time discovered on the site of the market place in the center of the village.

ORIENTATION AND ASSEMBLAGE. The ruined buildings occupy an area not more than two thousand feet from north to south and less than a thousand feet from east to west. Their orientation is exceptionally uniform; the walls do not vary in any case more than 4 or 5 degrees from the magnetic points as indicated by a compass not liable to an error of more than 1 or 2 degrees. This uniformity is rendered more notable by the fact that there is considerable variety in the materials and construction of the structures as if they had been built at different times or under unlike conditions.

THE BUILDING MATERIALS. Stone and adobe were the chief materials employed in the buildings that now remain, but wood was used to a large extent and must have been employed extensively in the less important buildings and in the construction of dwellings. Although there are workable sandstones and some beds of limestone

* To those familiar with the sketch map of Mitla published by Mr. Bandelier in his "Mexico," the definiteness and regularity given the forms of the ruins in my map may seem an exaggeration. Mr. Bandelier has chosen to present the forms of mounds as they appear to-day, encumbered and obscured by modern buildings, walls and fences, at the same time failing to do justice to the symmetry and the accuracy of line and angle of the buildings. I have endeavored to show the standing structures exactly as they are, and besides have tried to express in dotted lines something of what is definitely known or safely surmised of forms now represented by remnants merely.

exposed in the valley, the trachytes were preferred, and these are unsurpassed as building material even by the massive limestone of Yucatan. The convenience and tractable nature of the trachytes encouraged the use of large masses, and there are now to be seen in the various buildings upwards of fifty lintel stones, ranging from 10 to 20 feet in length and from 2 to 4½ feet in each of the other dimensions, the weight varying from 10 to 15 tons; besides these there are more than twice that number of columns, jamb-stones and ceiling slabs of only slightly inferior proportions. Hundreds of others have been destroyed or lie buried beneath accumulations of debris. The quarrying, dressing and handling of these stones required great expenditure of labor on the part of a primitive people. But the numerous buildings also required vast numbers of smaller hewn stones for facing the walls—exterior and interior, and the number of small dressed bits employed in the geometric mosaics is almost beyond estimate.

Beside the cut stone employed in building, other materials were required in vast quantities. Rough stone had to be gathered from the bluffs and mountain slopes for the interior mass or hearting of terraces, pyramids and walls; adobe, to be obtained in unlimited quantities in the vicinity, had to be mixed and transported at all stages of the work as a matrix for the stone, and beside was made into bricks for the construction of one, at least, of the great groups of buildings ; then there was cement or concrete made of lime mixed with gravel for the laying of roofs, floors and pavements. There occur also in the adobe mortar of the walls countless flaked flints which will be referred to in another place.

There were required also great quantities of paints, mainly mixtures of whitish earths and iron oxides, with which the buildings were washed within and without—not only once but at frequent intervals—so that in days of prosperity the city must have presented an attractive and brilliant appearance.

Lastly, we must not overlook the use of wood. This material was probably not extensively used in the stone buildings save in the construction of ceilings or roofs. That stone also was used for this purpose in some cases is readily seen, although wood was employed for all long spans; in the northwest hall of the Quadrangle of the Grecques the end sockets of several ceiling beams and the impression in the mortar matrix of one round side are still preserved. According to this evidence the timbers used were about 12 feet long by 12 inches wide and 7 to 9 inches thick. They were probably hewn flat on the upper and under sides. Larger timbers must have

been used in the wider spans of the Hall of the Columns, and in several other buildings. The buildings now existing or distinctly traceable would have required some 1,500 beams if spaced as indicated by the sockets referred to above. The cutting of these timbers was no insignificant work for a people whose implements were much better suited for shaping stone than wood.

MASONRY. The masonry of the Mitlan buildings is of a superior order, and all are forced to admire the precision of the stone laying and the stability of the work. The erection of one of these massive piles was a great undertaking for stone age builders, and must have consumed a vast deal of time. When the character of the building had been decided upon and the plans sufficiently matured, the hewers of stone, the carriers of water, and the compounders of mortar, assembled their materials on the chosen site and the mason began his arduous work. The low mass of the foundation terrace, composed of adobe and broken stone, was heaped up in approximate shape, and the courses of hewn stone were carried around the base and added one upon another; or, if the surface was to be finished in plaster, the facing was of undressed stone or rubble. Where dressed faces were required the rough hewn stone was brought forward in sizes assorted according to the course to be laid and each piece was trimmed and fitted to its place. The margins were so accurately cut that the joints required little mortar, but the back was rough and often somewhat pyramidal in shape so that it set more or less deeply into the mortar bed. Where the walls were plain the stones were shallow; but where decided variations of profile occurred certain pieces were long and penetrated the rubble mass behind, binding the structure firmly together as shown in some of the accompanying sections.

It has been stated by some visitors to Mitla, and repeated by several writers, that mortar was not used in laying the cut stone. This I find to be only partially true. It seems to have been the aim of the builders to make the joints so perfect that lines of junction would be invisible, and this was practically accomplished in many of the most prominent portions of the work; but it is found that in some places, especially in the mosaic work and about the margins of the large lintel and jamb-stones, mortar was freely used to fill out spaces and even up the surfaces. The mortar was of excellent quality and where surfaces were to be finished in color there was no good reason for avoiding its use in the manner indicated.

In all of these buildings there was very little simple stone laying, where sizes and angles were uniform and course followed course as in brick work. A few courses here and there are continuous all

around the building, but nearly every course was a special course, differing in width, angle, or projection from its neighbors, and nearly every stone was a special stone, cut and fitted to its individual space.

SUBSTRUCTURES. Pyramid building was not so important a feature with the Mitlans as with other great builders of Mexico. Two of the principal groups of buildings rest on the unmodified, or slightly modified, surface of the ground; the terraces of a third are not over 12 feet high in any part, and the fourth and fifth groups have one pyramid each 25 feet high, with others of inferior height. Altogether there are five quadrangular groups having substructures for all their buildings, although all are not well defined at the present time. The fully developed pyramid was built in steps, ranging, so far as can be made out, from 6 to 10 feet in height. Only one example remains in which these steps are preserved, and that is the east structure of the South Side Group. If the drawings published by Dupaix are to be relied upon, one of the groups—probably that of the Adobes—had all four of the pyramids terraced, three with two stages each and one with four (*b*, Fig. 73). The faces of the terraces are nearly vertical and were finished in some cases with cut stone and probably in other cases with plaster or cement. The floors of the terraces were of cement and possibly in some instances of stone, and are not more than 4 or 5 feet in width in any case.

The hearting of the pyramids and terraces was of irregular stones, set in adobe mortar, or of adobe bricks—the latter material prevailing in only one group which I have called the Group of the Adobes.

The horizontal dimensions are only such as to accommodate the superstructures and leave space for the narrow esplanade and terraces. The largest are about 145 feet in length and 60 feet in width. Many were closely joined at the corners of the quadrangle and some

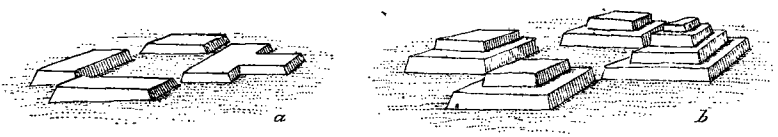


FIG. 73. EXAMPLES OF MITLAN PYRAMIDS OR SUBSTRUCTURES.

a. Platforms of buildings in the Group of the Columns.
b. Pyramids of the Group of the Adobes, as given by Dupaix.

were coalescent at contiguous corners to their full height; while in one case at least the four members of a quadrangular group were entirely coalescent, the buildings also being joined. Examples are presented in Fig. 73.

It is unfortunate that no example of a stairway has been preserved, and I cannot recall having seen a step, or the trace of a step, in Mitla. Early plans and drawings show stairways in the Group of the Columns, leading from the courts into the inclosing buildings, and in the subterranean passageway of the south quadrangle of that group. Judging by the general style of the stonework, and the width and elegance of the doorways, the stairways must have been commodious and well built.

SUPERSTRUCTURES. The buildings of Mitla have been called temples by some, palaces by others and communal houses by still others, but the function is and must be largely a matter of conjecture. On general principles I would incline to attribute their erection to religious inspiration, but in their plan and arrangement they do not correspond closely with the specialized and generally isolated temples of Yucatan and other sections of Mexico. Communal use is strongly suggested, and the secluded courts would have afforded convenient retreats for the women of the community or for special social or sacerdotal groups.

THE GROUND PLAN. The ground plan is simple, as in other sections of Mexico, presenting only a limited number of exceptional features. As a rule the buildings are long and narrow and contain but a single chamber. In the north building of the South Side Group there are traces of partition walls, and I observe, also, that two of the buildings within the walls of the fortified hill south of Mitla have partition walls apparently belonging to the original construction; but as these buildings may have been remodeled, more or less completely, for use by the modern inhabitants, it may not be safe to speak of this feature as certainly belonging to the original structures. It is to be noted that the buildings in which the partitions occur are in several respects distinct from the structures of the central group, and may belong to a later date if not to a distinct period or occupation.

The ground plans of the various buildings are shown—on a small scale—on the accompanying map. It is seen by these, as well as by the panorama, that there are five clusters or groups of structures, numbered—beginning at the north next the trachyte bluff—I, II, III, IV, V; and for convenience of description I have named them—in the same order—the Group of the Catholic Establishment, the Group of the Columns, the Arroyo Group, the Adobe Group, and the South Side Group. Group I comprises three quadrangles, lettered—beginning at the north—A, B, C. Group II has three quadrangles, lettered D, E, F. Group III has three quadrangles, lettered G, H, I. Group IV has one quadrangle, lettered J. Group V has two quadrangles, lettered K, L.

Before proceeding to give numbers to the separate buildings an analysis of the grouping of the buildings is necessary, as otherwise the reasons for separate numbering may not be apparent. The enumeration of twelve quadrangles might lead to the expectation that four times that many buildings would be found, but this is not the case, as the buildings do not all stand apart but are joined in various ways and in some cases appear to fully coalesce, whereas in other cases there are omissions of single buildings. Three types of arrangement may be illustrated: In *a*, Fig. 74, a simple symmetric quadrangle

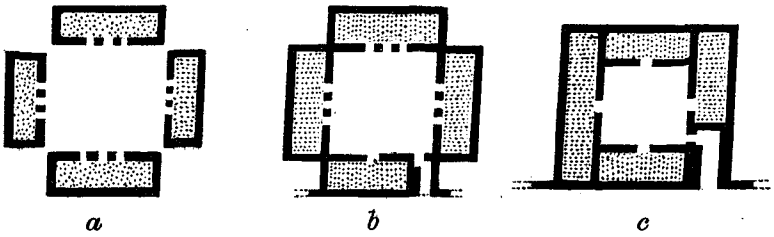


FIG. 74. VARIATIONS IN ASSEMBLAGE OF THE BUILDINGS OF A QUADRANGLE.

a. Separate and symmetric placement of the four buildings.
b. Four buildings joined at the inner corners, and having a special entrance way.
c. Condensed arrangement with special entrance way.

is shown in which the four separate buildings inclose a court open at the corners. In *b* the four buildings are joined at the inner angles, inclosing the court with a continuous wall. There may be combinations of *a* and *b* in which one, two or three of the corners are open. In *c* two of the buildings are set in so far between the others that the structures become practically a single structure with four rooms, inclosing a court. The two inserted buildings form short chambers.

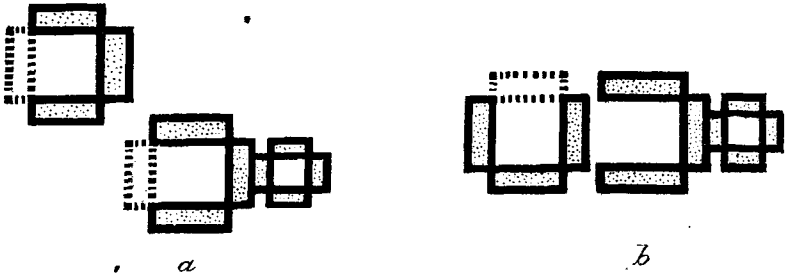


FIG. 75. ASSEMBLAGE OF QUADRANGLES IN CLUSTERS.

a. Arroyo group.
b. Group of the Catholic Establishment.

Now in the combination of these quadrangles into clusters other modifications of the plan take place, which must be kept in mind if a clear notion of the ground plan is to be secured. In a wholly

independent grouping of three quadrangles the arrangement could be extremely varied. An ordinary placement is shown in *a*, Fig. 75, but combinations may be made as indicated in *b*, where two adjoining quadrangles make use of one building in common, thus eliding one member. The only example that needs especial explanation is that occurring in Group II, where the northern quadrangle, D, is not only closed completely, as shown in Fig. 93, but its south wall becomes the north wall of the adjoining quadrangle E, and the combined structures, connected by a passageway, become practically one building of five chambers, and as such they have generally been regarded. Proper analysis demands that each of these chambers be treated as a member of a quadrangle. The numbering of the whole series of units (see map), beginning at the north—the letters belonging to the quadrangle and the figures to the buildings—will be as follows: A, 1, 2, 3, 4; B, 5, 6, 7, 0; C, 8, 9, 10, 11; D, 12, 13, 14, 15; E, 16, 17, 18, 19; F, 20, 21, 22, 23; G, 24, 25, 26, 27; H, 28, 29, 30(?), 31; I, 32, 33, 34(?), 35; J, 36, 37, 38, 39; K, 40, 41, 42, 43; L, 44, 45, 46(?), 47(?).

The diversity in the arrangement of building units gave rise to much diversity in the manner of securing access to the courts and chambers, as shown clearly in the ground plans. There is practically no exterior doorway in Mitla. Courts were entered by openings between buildings at the corners, but these openings were not treated as doorways since the corners of the buildings remained normal. Courts with closed walls were entered by narrow passageways from an adjoining open court. The individual buildings were, in all or nearly all cases, entered from the courts.

As indicated in the plans, the buildings—keeping the fundamental unit of construction in view—are long and narrow, the width being limited by the capacity of the ceiling span to a single beam length—not over 12 feet—or to two beam lengths—not over 23 feet. The duplicate series occurred in exceptional cases only. The length was not necessarily limited. The greatest exterior width is about 30 feet (that is 23 feet, plus the thickness of the two walls), and the greatest exterior length is 133 feet. The doorways occur singly or in groups of three. The only other features of any particular moment, appearing on the plan, are the columns ranged along the middle of the double-width apartments, the poorly defined central piles of debris in the courts, and the strangely arranged subterranean chambers of building 20. The latter will be illustrated in connection with the description of that building.

PROFILE AND CONSTRUCTION. In viewing these buildings I am constrained to believe that the details of construction must have been well

made out before the foundations were laid or the mason began to place his facing of cut stone. So complex and varied is the mural treatment that haphazard work is out of the question. If there were no elaborated drawings to place in the hands of the mason there must have been at least a master mind to predetermine the general treatment and superintend every detail.

The walls of these buildings are quite as massive as those of Chiapas and Yucatan, many being over four feet in thickness. They are carried up vertically, or nearly so, to the full height of the building, and are faced with dressed stone or with plaster. In general the treatment of the exterior walls and of the façades proper (which look in upon the courts) is much the same. The inner walls of chambers or halls are either plastered or partly or wholly covered with geometric mosaic-work. Exterior walls are not broken by openings of any kind. The doorways, arranged singly or in threes, occupy the centers of the inner façades, so that entrance is obtained from the courts. In three cases, at least, closed or boxed courts were entered by narrow passageways from contiguous halls of adjoining quadrangles, as best expressed on the ground plans.

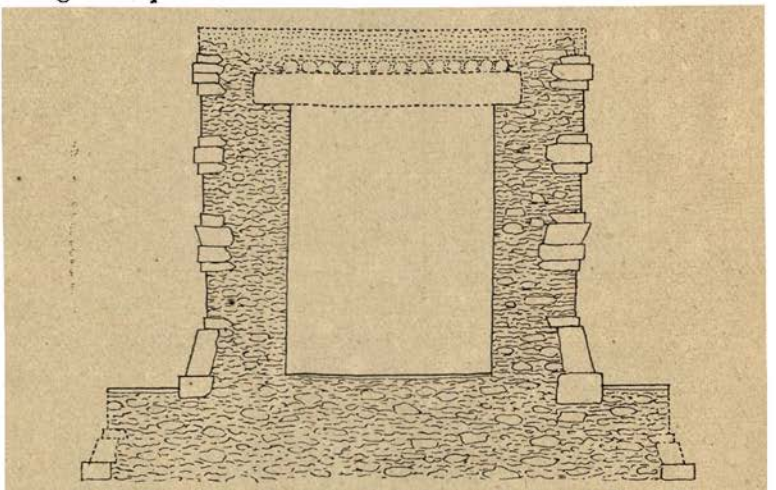


FIG. 76. TRANSVERSE SECTION OF BUILDING OF SINGLE BEAM SPAN.
The beam and roof are restored in broken lines. Width, 10 feet.

The buildings are only a single story in height and there is no trace of a second story or of an attempt to give additional effect of height by means of false fronts or roof-combs. The arch was not used and ceilings and roofs were flat. In constructing the roofs the lateral walls were connected by cross beams of wood, now entirely obliterated, or, where the covered space was very narrow, by slabs of

stone. The height of the exterior wall rarely reaches 15 feet, and the height of the ceiling was seldom over 12 feet. The roof was 3 or 4 feet thick, and consisted of the ceiling timbers overlain by stone, by cross timbers or by pliable vegetal materials covered with rubble and cement. The roof surface appears to have been of cement and was level or sloped only enough to give necessary drainage.

The entire construction, so far as made out, is clearly shown in Figs. 76 and 77, and details of the roof, which must remain somewhat conjectural, are indicated in dotted lines. Where single lengths of beams were used, as in Fig. 76, the chamber or hall does not exceed 12 feet in width. Where a wider space was desired a row of pillars or columns was planted along the middle of the inclosure, timbers were laid longitudinally connecting column with column, and other timbers in two courses were laid across connecting the longitudinal series with the sidewalls, as indicated in Fig. 77. By means of this

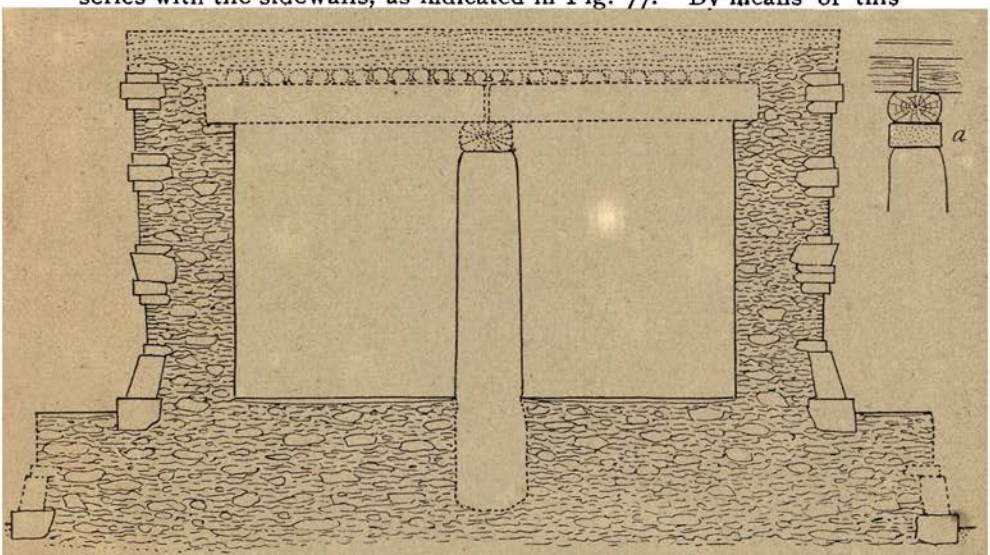


FIG. 77. TRANSVERSE SECTION OF BUILDING OF DOUBLE BEAM SPAN.

The beams and roof are restored in broken lines. Width, 22 feet.

device at least three of the halls were given a width of from 20 to 23 feet, and the width between the columns was about equal to the space between the columns and the lateral walls—the extent of a beam span—so that these halls were really very spacious, though necessarily low and gloomy. So far as I could determine there was no variation from the arrangement here indicated. Where slabs of stone were used instead of the wooden beams the covered spaces were limited to a width of 6 feet or less.

DOORWAYS. The doorways of the Mitlan buildings are in no case exterior to the quadrangle but enter from the courts. They are almost always central to the building, and occur singly or in groups of three, according to the length or importance of the façade to which they belong. As in the Maya cities there are no indications of the employment of fixed doors by the original occupants. The opening is not so large as in the Maya structures; the height never exceeds 7 feet and the width is but little greater. Though somewhat complex and varied in effect as the result of offsetting, paneling and other forms of embellishment, the doorways are all entirely simple in construction, involving no new or exceptional principle or feature. They embody but the three essential members, the sill or floor, the vertical jambs and the horizontal lintel. A typical example of the single doorway, showing details of construction, is illustrated in Fig. 78. It has

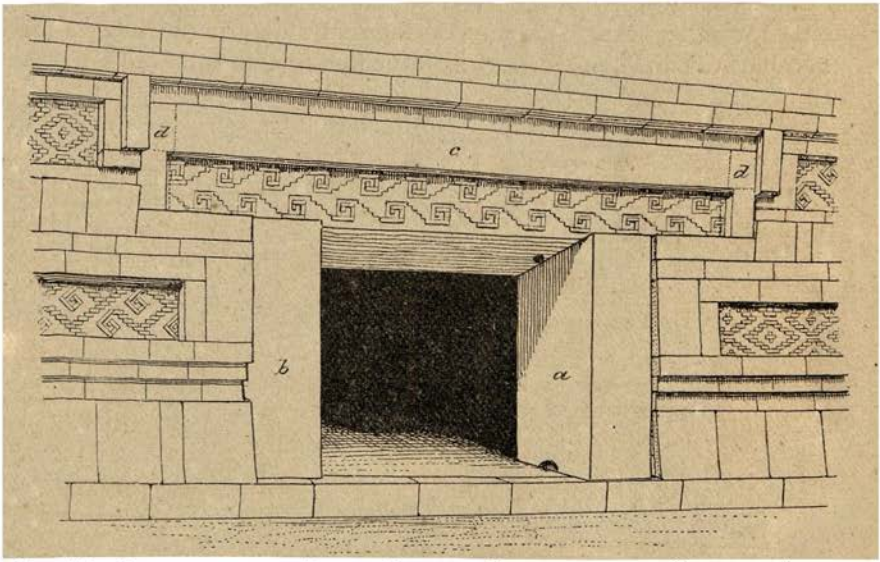


FIG. 78. CONSTRUCTION OF SINGLE DOORWAY, EMPLOYED WHERE SPACE WAS LIMITED.
This example leads from the court of the grecques to the west chamber. *a* and *b*, massive jambs; *c*, upper undecorated portion of lintel; *d*, *d*, stones added to give lintel-space desired length, Jamb-stone on left side restored. Height of opening, 5 feet 5 inches.

a clear cut and substantial look that is highly pleasing. The lintel is 12 feet 6 inches long, 2 feet thick and 3 feet 6 inches through from front to back. It is paneled on the exterior or front face, and the sunken surface is occupied by lines of beautifully sculptured fretwork; the back is flat and flush with the grecque-covered chamber wall and is sculptured in continuation of the lower zone of grecque mosaic. As indicated in the drawing the great stone used fell a little short of

the length desired for the lintel panel and small stones (*d*, *d*) were added at the ends, but so neatly adjusted that it is difficult to detect the joints. On the under side of the lintel, near the ends of the exposed surface, there are two round holes a few inches in diameter and depth, probably drilled by post-Columbian occupants for the hanging of some form of door. The jamb-stone is 5 feet 5 inches high, 3 feet 7 inches in width, and 16 inches thick. It is entirely plain, save that at the base, as shown in the figure, there is a roughly excavated depression, made probably, as was the hole in the lintel above, to aid in swinging a doorway. The faces of these stones, where protected from the weather, show traces of a very thin coating of hard, highly polished plaster. The sill is faced with dressed stones set on edge and continuous with the lower course of the wall; it is about 7 inches above the floor of the court in front and on a level with the cement floor of the inner room, the cement coming forward to the facing stones. The mural masonry framing in the doorway and the adjacent panels of fretwork is indicated at the right and left.

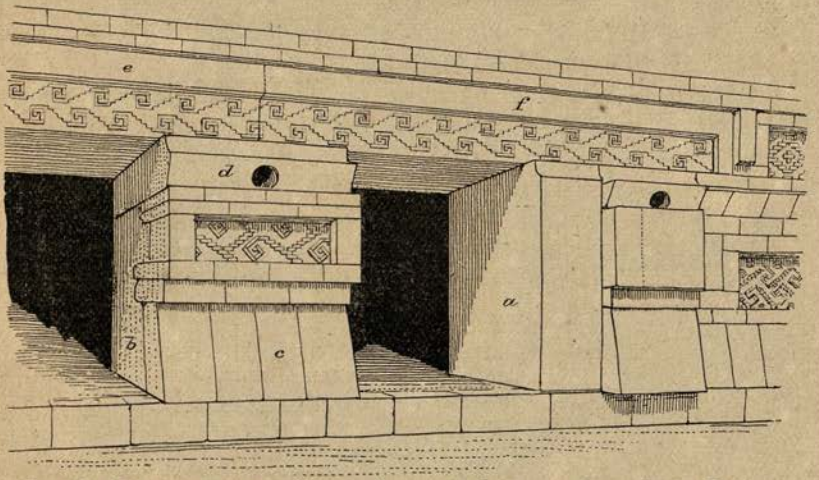


FIG. 79. CONSTRUCTION OF TRIPLE DOORWAY, ONE-HALF ONLY BEING SHOWN.

a. Lateral jamb-stone with decorative projection at right.

b, *c*. Pier separating doorways, with embellished facing of cut stone, with plastered sides (*b*) and heavy capstone (*d*).

d. Socket in capstone for porch or awning beam.

e. Part of middle lintel.

f. End lintel.

Height of opening, 6 feet 7 inches. Full length of lintel, about 48 feet.

In the larger buildings triple doorways were used (Fig. 79) which occupy the center of the façades facing the courts. The builders were evidently ambitious to give these portals a superior degree of importance, and, though low and formal, they are really striking features.

In appearance they present marked contrasts with the Yucatec portals, but differ little in general characteristics from the pillared doorways of Palenque. The only really great feature is the lintel, which is in some cases upwards of 50 feet in length. It is invariably composed of three sections which meet over the piers, the outer ends extending several feet into the masonry of the wall. The lower half of the exterior face is always sunken or recessed a few inches, and is occupied by sculptured fretwork or by painted designs. The front and under surfaces are always well finished, but the top, hidden by superincumbent masonry, is left unhewn. In the preserved examples there are but two jamb-stones, placed one at the extreme right and the other at the extreme left, while the piers are built up of hewn blocks without and plastered masonry within. The lateral and inner surfaces of the piers are plain, but the exterior face is varied by offsetting and paneling, and near the top in each case a hole has been drilled, probably for the insertion of the framework of an awning or roof intended to shade the stairway and entrance. The jamb-stones at the extreme right and left are quite plain, but, as indicated in the drawing, they are supplemented on the outer side by a peculiar feature which repeats in a measure the effect of the pier fronts and gives necessary balance to the effect. The piers are in all cases capped with large, squarish stones supporting the lintel and holding together the masonry beneath. The masonry, framework and mosaic panels surrounding the portals are of the usual types and are well illustrated in Plates XXXI and XXXIV.

Much simpler than the main doorways are the entrances to the dark passageways leading into the boxed courts. These accord in

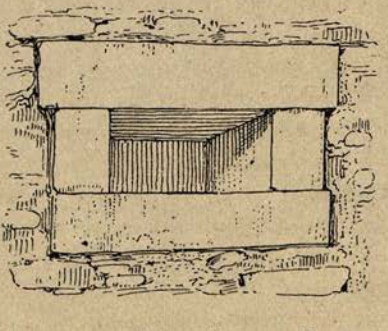


FIG. 80. NICHE IN THE BACK WALL OF PRINCIPAL HALLS.
That in the Hall of Six Columns is 30 inches wide, 17 high and 23 deep.

style with the wall into which they are introduced, resembling the single doorway described above when penetrating stone-faced and

paneled walls, and framed in by heavy lintel and jamb-stones when in plastered walls.

The only additional wall variation, aside from the decorative features, are certain niches or oblong, rectangular recesses in the rear wall of the chambers, always facing the entrance and 5 or 6 feet from the floor. They are about 2 feet in length, 18 inches in height and 20 inches deep, and are faced with dressed blocks, as seen in Fig. 80. Their use is a matter of conjecture, but their general presence and uniform position indicate that the function was of considerable moment. Possibly they were shrines and served to contain some sacred object—an image or symbol—to be saluted on entering the doorway.

COLUMNS. In Yucatan round columns were used in the doorways forming rudimentary porticos or colonnades, and also in the interior of the buildings as vault supports. In Mitla their use was confined to the interior, where they were employed chiefly to support the horizontal roof timbers of the wider chambers. There are but three or four halls so wide as to make such roof supports necessary, and in two of these—the north and east halls of the Quadrangle of the Columns—the fine shafts are still standing, the full number—six—in the north hall, and two only in the east hall where there were, I believe, originally five. All the missing specimens (supposing there were only eleven of like dimensions in the city) are accounted for; one lies in the court near the west side, and two form pillars for a porch at the eastern doorway (modern) of the quadrangle now occupied as a curacy. These columns are carved from massive trachyte and are about 11 feet in length above ground and perhaps 15 or 16 feet in full length. The diameter is from 30 to 36 inches below and falls off to from 20 to 24 inches above. In cubic dimensions they are nearly equal to the larger lintel stones, having a weight of some 6 or 8 tons. They are ranged along the center of the hall, and doubtless supported longitudinal ceiling timbers upon which rested the inner ends of the transverse beams, as indicated in several plates and figures. A smaller column occurs in the basement chamber in quadrangle F, where it supports heavy ceiling slabs; it is shown in Pl. XXXVI.

The height of the columns in the Hall of the Columns (11 feet to 11 feet 4 inches) is not quite equal to that of the lateral walls (apparently 12 to 13 feet), but the longitudinal beams, which we suppose to have rested upon them, would bring the level up to about that of the walls, thus giving a uniform level for the cross timbers. It is not impossible that capstones were used to give a little additional height to the columns.

ROOF CONSTRUCTION. Considerable speculation has been indulged in as to the kind of ceiling or roof support employed, but a close examination of the remains sufficiently indicates the use of wooden beams. Although the wood is gone the impression of the rounded

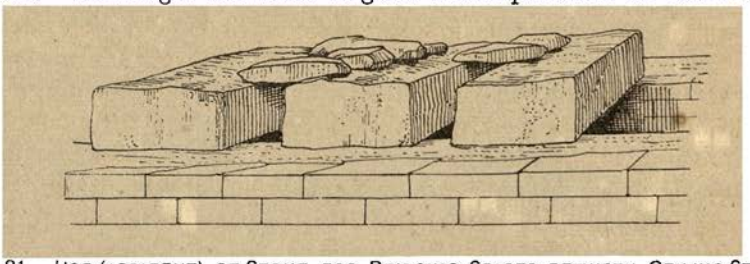


FIG. 81. USE (APPARENT) OF STONE FOR BRIDGING SPACES BETWEEN CEILING STONES.

side of one of the logs remains, and the sockets into which the ends were inserted are well preserved. These features are shown in Figs. 95 and 96. A more difficult question is that of the covering of the beams and the nature of the floor upon which the roof of rubble or

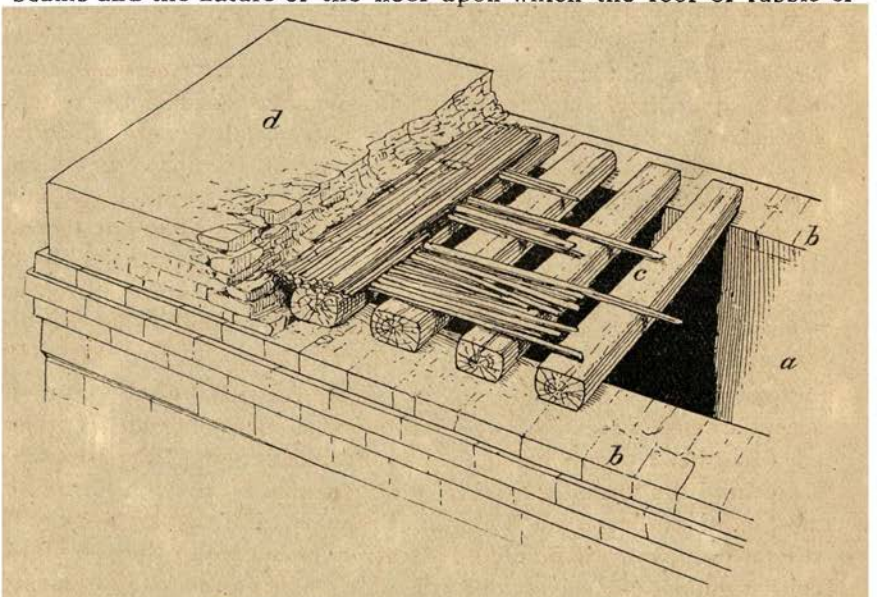


FIG. 82. THEORETIC ROOF CONSTRUCTION.

a. Chamber space covered.
b, b. Lateral walls.
c. Wooden beams with covering of small timbers or canes.
d. Superincumbent roof masonry with cement surface.

cement rested. Poles, twigs and matting have been suggested and all may have been employed though no trace now remains. It is observed that in places where ceiling stones are still in place the inter-

spaces show nothing but loose stones, Fig. 81, but these conditions are just such as would result from the decay of the more perishable parts and the consequent letting down of the superincumbent masonry.

The drawing presented in Fig. 82 is intended as an analysis of the roof construction, the assumption being that canes, poles or twigs rather than stones were used for the first course overlying the wooden beams. Illustrations of some details of roof construction appear in connection with the description of quadrangle D a little farther on. It is presumed that a bed of rubble a foot or two thick was laid on the interlaced vegetal courses and that coatings of cement were spread over all, forming the roof surface. But the portions remaining are not sufficient to make the whole construction clear and we are at a loss to say whether the surface was level or whether, as suggested by some slight remnants, it was sloped to facilitate drainage.

MURAL EMBELLISHMENT. The Mitlan buildings are exceedingly formal in profile as well as in ground plan. There is little departure from the simple, rectangular mass of masonry save that due to the doorways and the little niches in the chamber walls. The mosaic panels and the minor projections and recessings that serve to frame them in diversify but do not break up the solid façades; the relief is nowhere more than a few inches. The surfaces were uniformly covered within and without with some form of decorative finish and, though the chambers were necessarily very dark, as much attention seems to have been given them as to the most prominent façades. Three methods of embellishment were employed in treating the walls, viz.: Painting, sculpture and mosaic. So far as we know stucco was not used by the Mitlan builders in the modeling of relief work or statuary.

SCULPTURE. Sculpture in its more restricted and commonly accepted sense seems to have been tabooed as completely as if a priestly edict had been promulgated forever prohibiting it. The absence of sculptured life forms is especially remarkable since such forms were most extensively embodied in other branches of Mitlan art work. The several fragments of painted decoration preserved in these buildings consist almost exclusively of forms of animals and men, and in a style which has no suggestion of the formal geometric treatment characterizing the masonry embellishments. The Zapotec modeler in clay also was extremely fond of life forms, and treated them with a boldness not surpassed anywhere among a race of potters. The extensive use of life forms in art cannot, therefore, be denied the builders of Mitla. A few fragments of low relief sculpture employing life forms have been noticed within the limits of the present village, but no one

knows their origin or whether or not they have any connection with the ancient buildings. It is apparent that it was owing to no lack of capacity on the part of these peoples that sculpture did not take a place of importance. When the surface of one of the great lintels was to be finished in a style uniform with the geometric mosaics of the walls in which the lintels were imbedded, the chisel was used with excellent effect.

MURAL MOSAIC-WORK. Perhaps the most unique and remarkable feature of the Mitlan buildings is the fretwork decoration of the walls. It is found at present in two groups only—those of the Catholic Establishment and of the Columns; but it was probably employed in all the others, and I found some small cut stones of the kind used in the mosaics among the debris of the Arroyo group.

The fretwork designs are purely geometric, yet they are wonder-

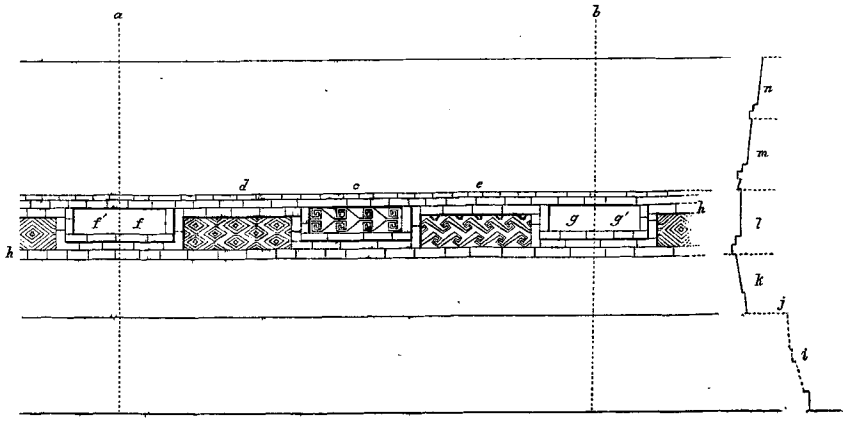
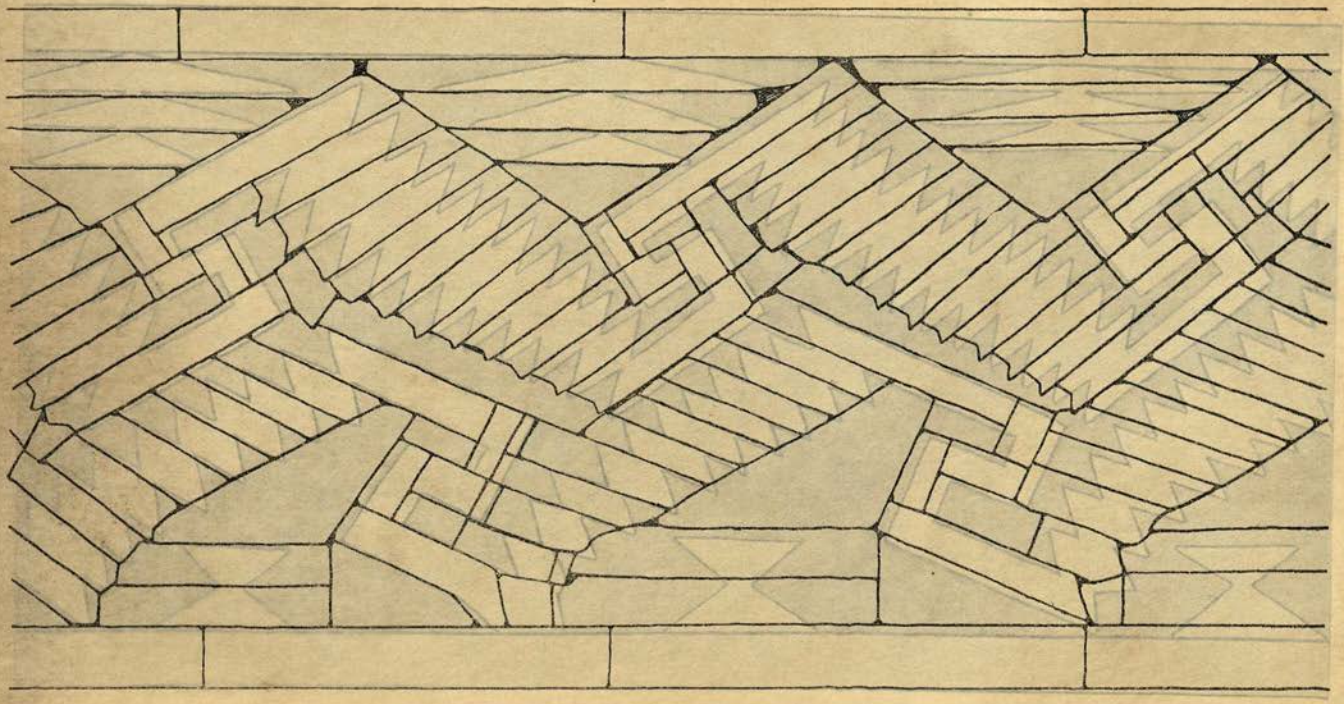


FIG. 83. CONTINUITY OF PANELED ZONES AROUND THE BUILDINGS.

The dotted lines *a* and *b* indicate the corners. The profile at the right is the corner profile; *c* is the middle panel of the wall *a*, *b*; *d* and *e* are the associated panels, and *f*, *f* and *g*, *g* are the corner blocks, the parts *f* and *g* belonging with the wall *a*, *b* and the parts *f'* and *g'* belonging to the adjoining walls. It is thus seen that the corner blocks are merely blank panels, though shorter than the panels proper; the meandering course of stone, *h*, *h*, incloses them precisely as it does the corresponding, decorated panels. The simplicity and consistency of the mural decorative work is thus clearly shown,

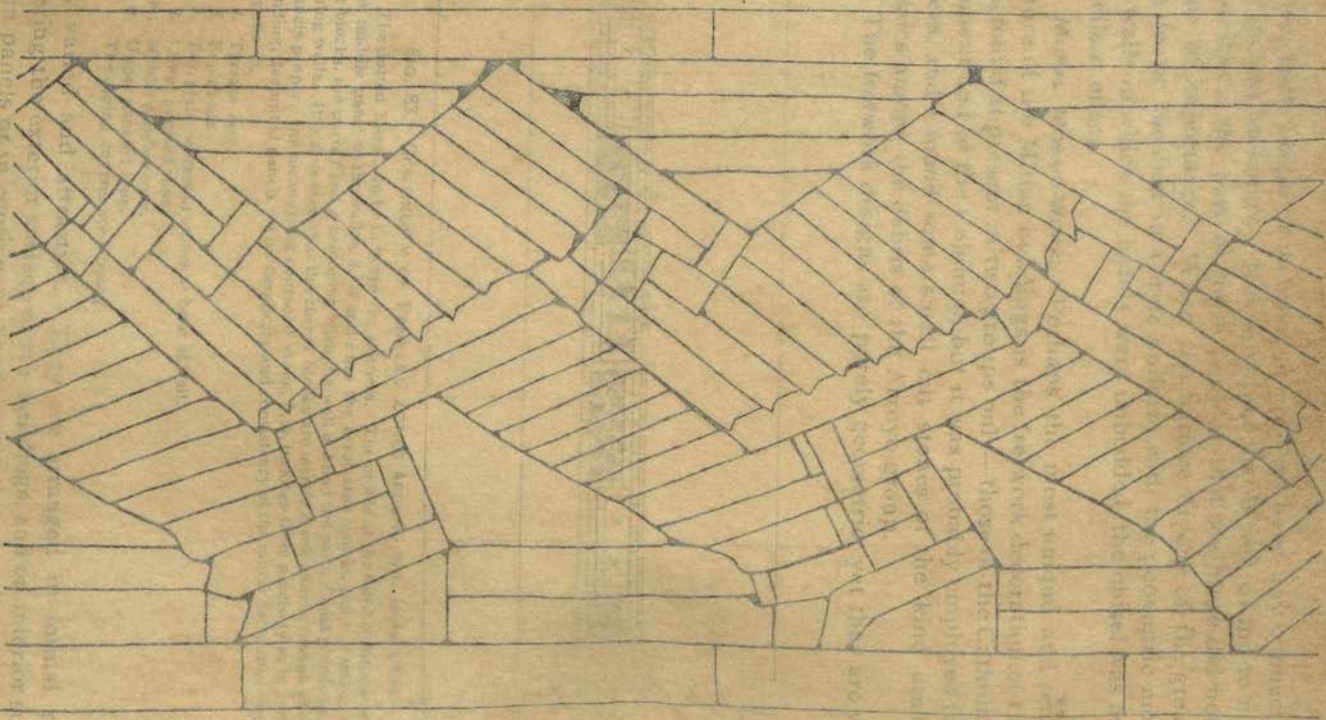
i. Terrace face.
j. Esplanade.
k. Two plain courses of stones at base of wall.
l. Lower paneled zone.
m. Middle paneled zone.
n. Upper paneled zone.
The coping courses are missing.

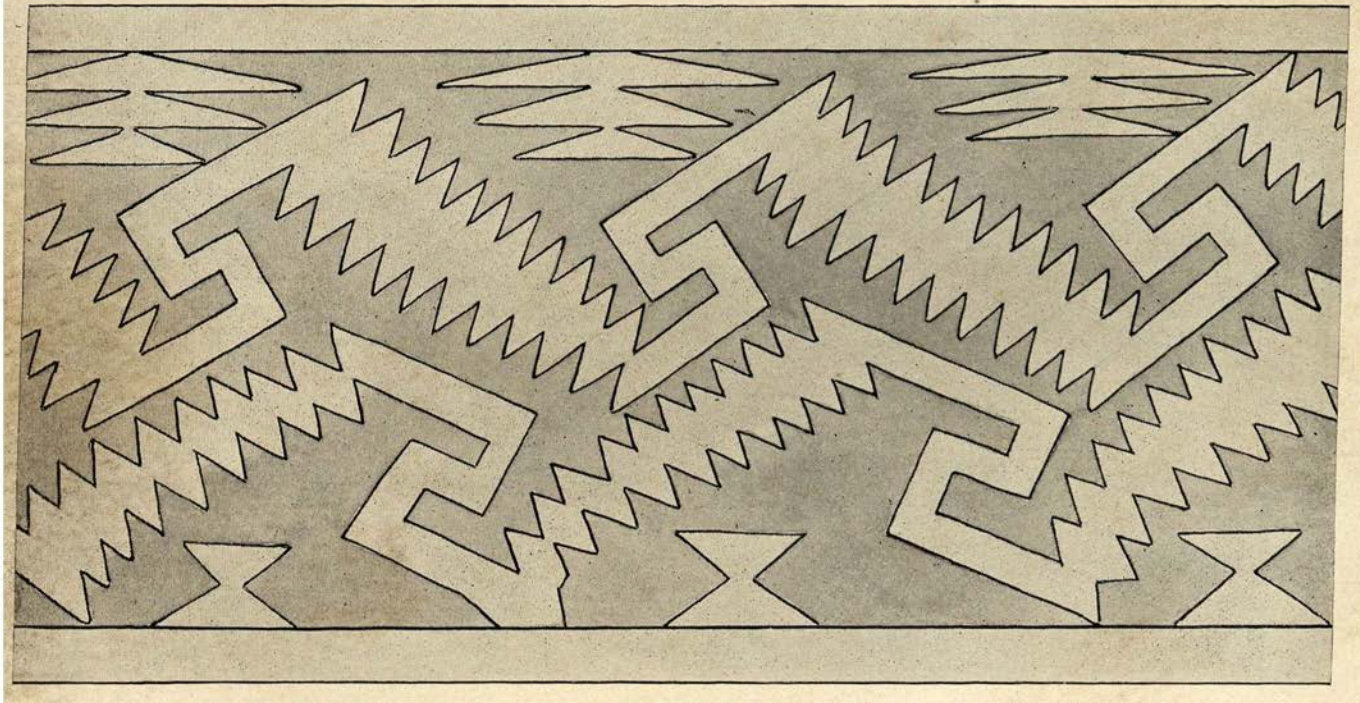
fully varied and attractive. They are arranged in formal panels, covering the exterior surface of the buildings, and on interior surfaces are in panels or in continuous bands encircling the chambers.



RELATION OF MOSAIC PATTERNS TO THE MOSAIC STONES.

Over-Sheet showing the separate stones of the mosaic.





RELATION OF MOSAIC PATTERNS TO THE MOSAIC STONES.

Under-Sheet showing the relief patterns cut on faces of mosaic stones.

Before taking up the decorated panels in detail it will be necessary to consider the treatment of the walls as a whole, and to examine the remarkable masonry framework with which the panels are surrounded. It is not known to what extent the facings of the substructures were embellished, as all are almost wholly destroyed, but it is probable that some were of rough stonework plastered, while others were of hewn stone, varied more or less by moldings, offsettings and possibly by cofferings. The exterior walls of the better preserved buildings, as well as the façades overlooking the courts, were occupied by three ranges or lines of oblong, horizontal panels of mosaic fretwork. Below, between and above the horizontal rows of panels, there are certain courses of the facing that extend entirely around the building without break or deflection; while one course is deflected in such a way as to partially inclose the panels framing them in as illustrated in Fig. 83. It will be seen by reference to the drawing that the corner blocks, which form a most striking feature of the mural treatment, are merely undecorated panels filled out to give solidity to the angles of the building.

Much diversity in the effect was given by setting some lines of this framework in and others out—as shown in the profile—as well as by variations in proportions resulting from differences in length between the members of the various zones of panels. Variations are more marked in façades broken by doorways. Where there are triple openings the decorated lintel panel is very long and has over it a grand panel of mosaic, as seen in the façade of the Hall of the Six Columns, Pl. XXXI. In the faces of piers between doorways, short, narrow panels are framed in, and on short wall spaces—as in the ends of the buildings—single panels extend the full length of the wall surface. A study of the sections given in several figures will make clear the numerous eccentric features of profile, notable among which are variations in batter or pitch of the courses of stonework. The general effect of the profile, as seen at the corners of the buildings, is that of considerable inclination outward in ascending, but a plumb-line reduces this to a very few inches, the effect of overhanging being due largely to the decided inward pitch of the wide course of stones next the base. The exact nature of the finish at the top—the coping—cannot be determined, as one or more courses have been lost all around.

The geometric fretwork mosaics of the seruins must always stand as one of the most noteworthy features of our native architecture; yet the work differs from the mural treatment of Yucatan in subject matter rather than in kind, for the decorated surfaces there, though depicting

animal forms, are mosaics in the sense that they are made up of separate hewn or carved stones set in mortar to form ornamental designs.

In the Mitlan buildings there are about 150 panels of mosaic, aside from the continuous panels of the four grecque chambers of quadrangle D. The greatest width of panel is about 2 feet and the

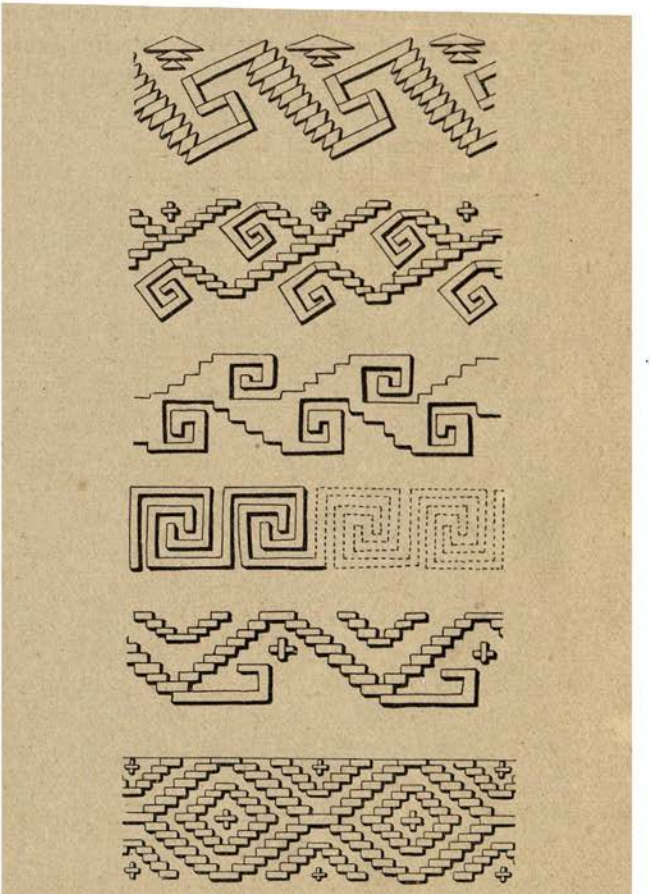


FIG. 84. MOSAIC PATTERNS—ANGULAR FORMS.

greatest length about 30 feet. The designers had only a limited number of motives to draw upon, but considerable taste was shown in the arrangement of these in various combinations to suit the spaces and to give diversity of effect. Alternation of motives was attended to, and although there is nowhere entire symmetry, care was taken that panels with like designs should be kept apart. Of the elements

employed. I may mention the meander, mostly or always used as a stem for other more highly specialized elements; the diamond, always stepped and always pleasing in its diaper-like effects; the S-shaped curve connected by stepped or curved stems; and the curved or angular hook set upon angular stems in a great variety of ways. Each unit of the curved forms is necessarily cut to the curve while the angular forms are as a rule set up from small blocks. As it is impossible to convey a complete notion of these ornaments without illustrations, a number of the forms are assembled in Figs. 84 and 85. A somewhat

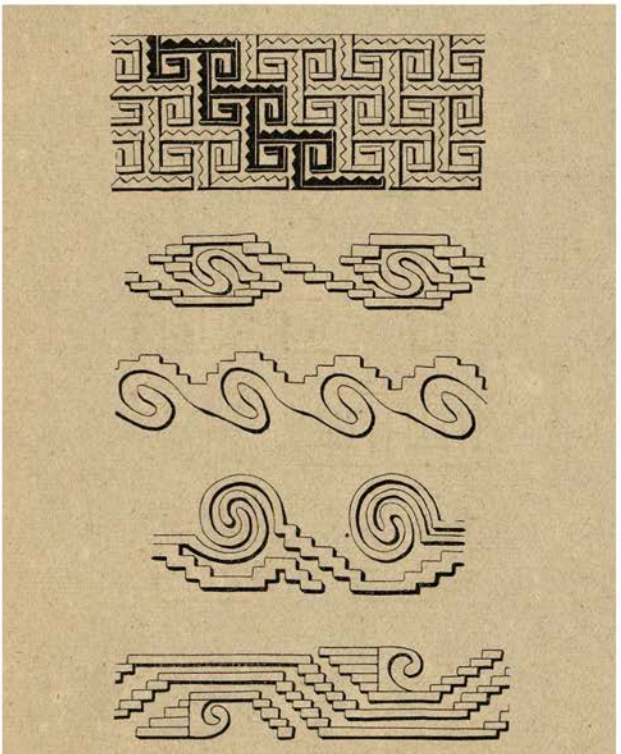


FIG. 85 MOSAIC PATTERNS—ANGULAR AND CURVED FORMS.

analogous use of similar geometric motives in mural embellishment is found in the "Hall of the Arabesques" at Gran Chimu, Peru, but it is to be noted that the same elements occur in the textile and ceramic arts of many of the more cultured American nations. Of course the stepped line so constantly recurring is a purely mechanical product resulting from the use of squared blocks in representing oblique lines. I have been unable to find any trace of graphic elements in these Mitlan

figures or the least suggestion that they were in any way significant. Of course it is not impossible that all the motives were symbolic and served to suggest to the builders some mythologic conception appropriate to the building or place. I have even been led to surmise, in view of the universality of symbolism in the native art, that possibly the decorated panels extending around the buildings represent the markings of the body of a serpent deity, and that the doorways with their teeth-like pillars stand for the mouth of the creature.

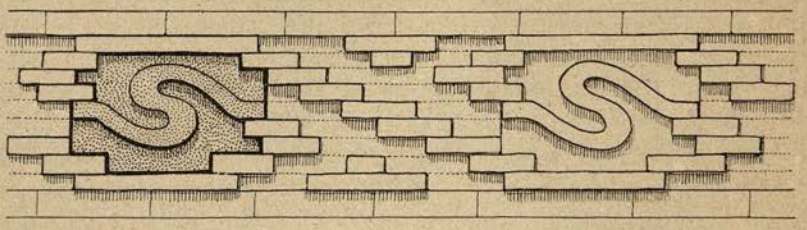


FIG. 86. INSERTION OF STONES WITH CURVED PORTIONS OF THE DESIGN CARVED UPON THEIR SURFACES.

The execution of this work is perhaps its most interesting feature. The panels in which the fretwork is set are all shallow, the framework rarely extending more than two or three inches forward from the face of the design, and the design is not relieved more than an inch and a half from its background. The bits of trachyte were cut into convenient sizes and shapes, and were deep enough to be set firmly in the plaster backing. The inserted ends are often tooth-like, and the tapering point or root is from one to six inches in length. It

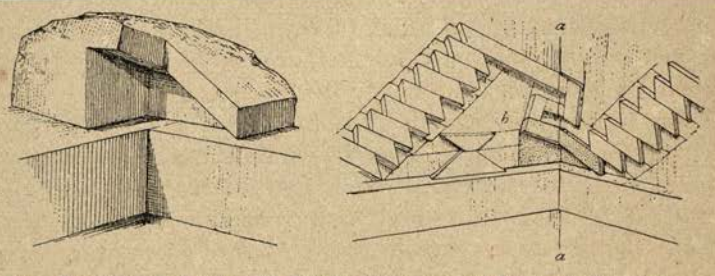


FIG. 87. STONES OF ECCENTRIC SHAPE USED WHERE DESIGNS TURN CORNERS OF CHAMBERS.

a,a. Corner of chamber.
b. Corner piece, shown on larger scale in figure at left.

is a noteworthy fact that the pieces of stone were not reduced to uniform shapes and sizes to be laid up as brickwork, but each individual stone was cut and fitted to its place in the design as the work went on.

This is especially noticeable in cases where a curved bit of design was to be inserted (Fig. 86). The S-shaped portion was carved in relief on a large piece, and this was fitted into place among its smaller neighbors by notching the edges. Another example is shown in Fig. 87 which illustrates the method of connecting the figures of the side and end of a chamber without joint at the corner. To show the rather haphazard fitting in of the stones employed in forming a line of fretwork I have prepared Pl. XXX, in which the discrepancies between the blocks of stone and the elements of the design are made apparent. The tissue sheet contains the diagram of the separate stones of the mosaic, and should be laid upon the sheet containing the design. The relation of the panels to the framework, the embedding of the tiles and other details are well shown in the section, Pl. XXXV. Several examples of the simpler dentate stones of the mosaic are outlined in Fig. 88. The number of these stones used—all carefully cut and fitted—is very great. A single room in the Quadrangle of the Grecques contains over 13,000, and the whole cluster of buildings must have contained nearly ten times that number. These mosaic stones are made of fine grained trachyte, and—although the rock is rather soft—the amount of labor required to block them out and cut and dress their surfaces can hardly be justly estimated.

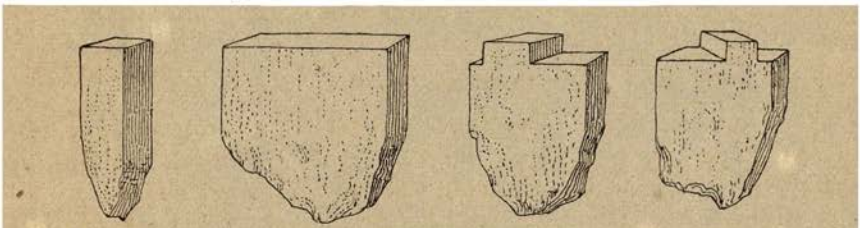


FIG. 88. FORMS OF ORDINARY DENTATE STONES USED IN MURAL MOSAICS.

There is, and will for the present remain, a question as to the exact manner in which the surfaces of these small stones were finished. Possibly the green stone celts, found occasionally about the ruins, were used. Possibly the flint hammer-stones, occurring in great numbers, were employed, though pecking operations would be difficult where the bits of stone were never more than a few inches in their greatest dimensions. It may be that the surfaces were evened up and finished by grinding.

PLASTER, CEMENT. It is not known where the Mitlan builders obtained their lime, but it will probably be found that suitable limestone for burning outcrops somewhere in the valley. It does not appear that lime was much used in the construction of foundations

and walls of buildings, for the adobe mortar was well adapted to this purpose; but the cement employed in laying floors, and the plaster used in facing up walls, was of excellent quality. The best example of cement flooring is found in the South Side Group where the three terraces of the great pyramid have had floors of unusual solidity. The mass of the mound is composed of earth or adobe and irregular stones. The surface to be concreted was first leveled up with rubble cement, from 4 to 6 inches thick, and then upon this a surface layer of fine cement from 1 to 2 inches thick was laid. So tenacious are these floors that where the supporting mass has crumbled away, they stand out in places 2 or 3 feet from the sides of the mound, and slabs several feet in length, 4 or 5 feet in width and 7 or 8 inches thick, have descended to the base without breaking up. As there has been some post-Spanish occupation of these structures it is probably not quite safe to assign all remaining features to the ancients, but this cement work may, I believe, be justly attributed to them. The surfaces of floors and walls were usually well smoothed and often in parts polished.

PAINTING. The art of painting was extensively and tastefully practiced by the ancient builders. As a finish for architectural surfaces color was used everywhere, a thickish, pasty distemper of several hues having been applied to plain and decorated surfaces alike, to stonework as well as to plastered walls and cemented floors. The colors used were largely white and red, with all grades of paler tints made by mixing these colors in various proportions. Other colors are rarely seen. The painted surfaces about doors and passageways have been in many cases highly polished—no doubt by rubbing. It would seem a superfluity to paint the beautifully finished and jointed stonework, especially where it embodies relief work of complex design, but it is apparent that this was done, and nearly all the scores of grecque figured panels show traces of pale red tones, mostly laid over a priming of cream or white. The amount of work involved was very great, but these strange peoples were evidently not averse to labor. The origin of the colors is not known, but they were probably composed largely of lime or the natural earths of the vicinity mixed with iron oxides.

PAINTED DESIGNS. It seems also to have been a common practice to finish certain important surfaces, such as those of lintels and door jambs, in elaborate designs, not geometric in character as were the relief wall decorations, but consisting of life forms more or less conventionally treated. Good examples of this work are seen on the lintels of the northern or Catholic Establishment group, and on

those of the Arroyo group below. Slight traces of similar work are seen in other places. The surface of the stone, though reasonably smooth, was not used for the designs but a ground of light gray color was applied and polished, giving a hard, even surface easily drawn upon with the brush. The work in the two groups is much alike save in subject matter and in minor details of manipulation. All are painted on the recessed panels of the lower half of the lintel faces. A small portion of the design from the lintel on the north side of the court now used as a stable by the Catholic establishment is given in Fig. 89, and a like bit from the north lintel in the southern court of the Arroyo group is presented in Fig. 90. Although I made pretty careful

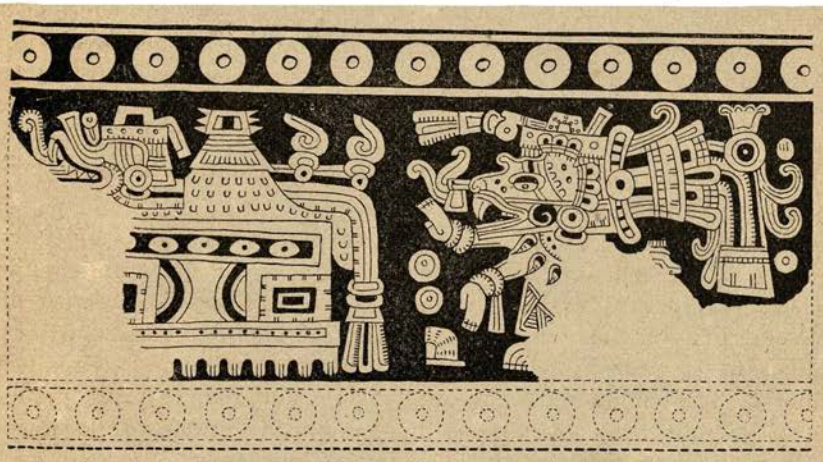


FIG. 89. SMALL SECTIONS OF PAINTED DESIGN FROM LINTEL IN THE CATHOLIC ESTABLISHMENT GROUP.

The outlines and background are in dark red, the design being left in the gray ground color.

drawings of these particular portions of the designs, because they seemed thoroughly representative, I found the copies published by Dr. Seler* more complete, showing portions now obliterated, and my illustrations are therefore traced from his work. Although the Seler reproductions are excellent and give a clear idea of the designs, they hardly do full justice to the originals, especially those of the northern group, which are executed with the greatest precision and neatness, the handling of the brush being that of a master. The space to be decorated was first coated with thick whitish-gray paint which was well polished down, then the elaborate design was worked out in dark red lines and further developed by painting in the background in dark red, thus leaving the figures glowing in the ground color. The draw-

* Seler, Dr. Eduard. Wandmalereien von Mitla, Berlin, 1895.

ings all show the remarkable mythologic subjects and peculiar style of convention characterizing certain of the ancient Mexican codices or books so well reproduced by Kingsborough. The fragment shown includes at the right a human figure wearing a strongly drawn grotesque animal mask, and at the left a house or temple with high peaked roof over which extends the body of a highly conventionalized serpent.

The paintings seen in the Arroyo group occupy the lintels of the southern quadrangle and are preserved only along the upper margin of the lintel recess where protected from the weather. The whole area in each of the lintels, some 30 feet long by 12 inches high, was prepared as in the other buildings by applying a coat of grayish color and giving it a high polish. The figures were then painted directly

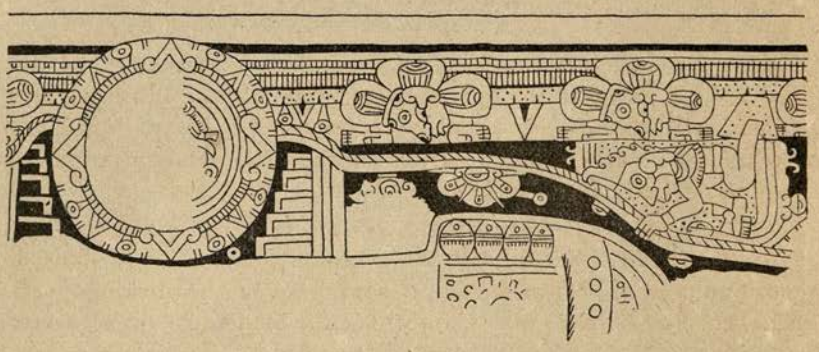


FIG. 90. SMALL PORTION OF PAINTED DESIGN FROM A LINTEL PANEL IN THE ARROYO GROUP.

Lines in dark red on a pale gray ground.

on this in dark red lines with a free and rather careless hand. The execution seems somewhat inferior to that in the other group, but the designs are equally elaborate and interesting. At the left, in the fragment reproduced, Fig. 90, there is a calendar like figure, which connects with other partially preserved figures on all sides. Above is a border of lines and dots, interrupted by the calendar figure and at regular intervals by abbreviated figures facing downward. Below is a human figure, placed with the head toward the calendar device and facing downward. This personage rests on one knee and grasps portions of the complex devices with his left hand. The left foot is replaced by a unique device. Seler, the foremost scholar in this field of research, has dwelt upon the significance of these remarkable delineations, rendering discussion on my part quite superfluous.

The position of these interesting remnants is shown in Fig. 91, which is a sketch of what is left of the north façade of the south court of the Arroyo group.

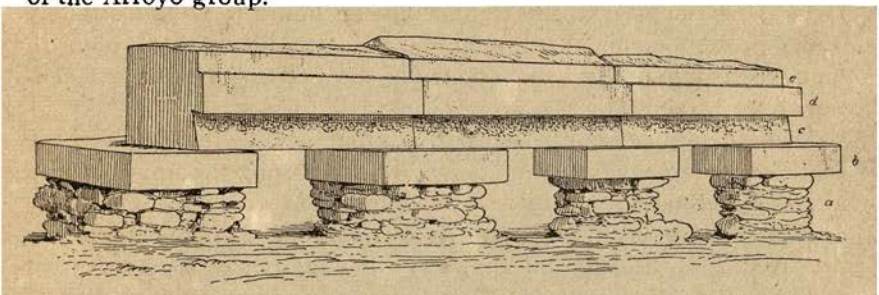


FIG. 91. SKETCH OF THE PAINTED LINTELS, ARROYO GROUP.

The painted figures occupy the surface marked *c*. Full length of lintel about 30 feet.

Not the least remarkable thing about these paintings is that they have stood exposed to the open air and largely to the full force of the elements, without loss of surface or freshness of tint, for a long period of years. The only protection was afforded by the slight projection of the upper part of the lintel (*d*).

GROUP OF THE CATHOLIC ESTABLISHMENT. This group of buildings is seen at the right in the panorama and is long, low and monotonous in appearance. It is seen also in the distance in Pl. XXXIII. The ground plan cannot be fully made out on account of the destruction of portions of the walls and the covering up of other portions by the Catholic establishment, but it undoubtedly includes three coalescent or closely associated quadrangles of medium size, each being represented by its squarish court and such of the inclosing structures as have not been destroyed. The ground plan given on the accompanying map is too small to show details clearly, but is as accurate as could be made without better facilities for examination than are now afforded. The roofs have wholly disappeared save perhaps a small portion covering in the narrow passageway that gives admission to the northern court.

The walls of the buildings are generally between 3 and 4 feet thick; they are rarely much more than 12 feet in height and there is nowhere any sign of a second story. The interior or body of the walls is built of rough stone, laid often with considerable regularity in coarse adobe mortar. The surfaces are, or were, faced with blocks of cut stone or were finished in plaster. The exterior walls, and also those facing the courts, were handsomely finished with panels of fretwork in relief framed in with courses of hewn stone. The doors are

all large and the jambs, lintels and pillar caps are usually of handsomely cut stones of large size.

The north quadrangle (A on the map and in the panorama) has a court about 52 feet square, now used as a stable. The inner walls of the four buildings inclosing the court coalesce at the corners, and still stand to nearly their full height; but the outer walls of the east, north and west structures are almost obliterated. The building on the north was entered from the court by three fine doorways, and those of the east and west by one door each; all are closed by masonry and partially buried in debris. The south building, which adjoins and has one wall in common with the north building of the middle quadrangle, is entered by a single door and has been so much remodeled for stabling purposes that I am not sure of the correctness of the plan as given, particularly at the west end.

The court of this north quadrangle was entered from the north hall or building of the middle quadrangle by a narrow, crooked and dark passage in the same manner as were the northern courts of the two other triple groups of quadrangles, (see ground plans). For convenience of stable use doorways have been cut directly through the walls of the two chambers separating the north and middle courts. The walls of this court are finished in handsome panels of fretwork, but the most notable features are the painted lintels over the doorways of the north and east walls. The lower half of the lintel surfaces, protected by the projecting upper part, still retains considerable portions of the skillfully painted designs already described in some detail and illustrated in Fig. 89.

The middle quadrangle (B) is occupied as a curacy and is apparently wanting in a south building, the court, which is about 60 feet square, being inclosed on that side by the back wall of the north building of the adjoining south cluster. The northeast corner of the latter building is separated from the southwest corner of the east building of quadrangle (B) by a space some two feet wide. This is now closed by a modern wall, but appears to have afforded a means of entrance to the middle and thus also, through the dark passageway, to the north quadrangle. As none of the buildings have doorways exterior to the quadrangle, admittance into the courts must have been obtained by some such opening as this. The construction of the corresponding features on the west side is obscured by changes made in preparing the rooms for residence. As seen in the panorama this middle quadrangle is now entered by a modern doorway on the east side, in front of which stand two round columns forming with the wooden roof a kind of portico. The columns were probably obtained

from one of the halls of the Group of the Columns below, as none of the chambers in the northern group appear to be wide enough to have made the use of columns necessary as roof supports. The exterior eastern walls and the walls facing the court have the usual panels of mosaic.

The Quadrangle of the Church (C) forming the south member of the group, is represented by portions of the east and south buildings, well shown in the panorama, and by the northern member. The west building, if such ever existed, has been destroyed or built into the walls of the church. The length of the east building is 88 feet on the exterior, and it is therefore probable that the court, now occupied by the church, was upwards of 80 feet square. The lintels of the doorways opening from this building into the court are barely visible above the mass of rubbish.

GROUP OF THE COLUMNS. In the immediate foreground of the panorama we look down upon the Group of the Columns. Its well-preserved buildings are the pride of Mitla and are among the most unique and remarkable of the many architectural remains of Mexico. This group, like the northern one, is composed of three quadrangles and, theoretically, at least, of twelve buildings or their representatives. Two of the quadrangles are large and one is small. The middle one I shall call the Quadrangle of the Columns (E); the southern, the Quadrangle of the Subterranean Galleries (F), and the northern the Quadrangle of the Grecques (D). The latter does not stand alone, but is coalescent with the Hall of the Six Columns—the north building of the middle quadrangle (E); and the four structures are joined in such a way that they become so many chambers of a single structure inclosing a court.

I will not attempt to present a fully detailed analysis of the many interesting features of this group of quadrangles, but content myself with a descriptive sketch of each quadrangle and the presentation of several sections and drawings illustrating points in construction.

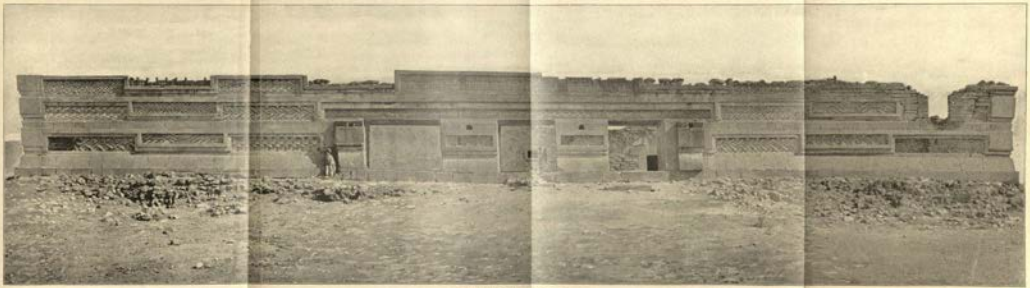
QUADRANGLE OF THE COLUMNS. A glance at the accompanying map will show the relations of this quadrangle to its associated quadrangles on the north and south. Its court (E), a shallow dish-like area about 150 feet from east to west and a little less from north to south, is bordered by the well-preserved Hall of the Six Columns (16) on the north and the three ruined structures (17, 18, 19) on the other sides. Originally the court was probably nearly or quite level; it was inclosed by the four steep faces of the platforms supporting the buildings, and these platforms were joined or but little separated at the corners and finished, no doubt, with hewn stone. It is reason-

able to suppose that broad stairways of cut stone led up to the buildings from the court, and possibly in the middle of the space there was a shrine or small structure of some kind, as in very many similar courts in the Oaxacan province. There are now, however, no traces of these features, and the only thing left to relieve the smooth surface of the court is a broken, half-buried column near the west side, where it has rolled down probably from the east building.

The east building (17), which appears in the immediate foreground of the panorama, is so well preserved that its character and dimensions can be accurately determined. The terrace or platform is about 6 feet high at the north end, and 10 or 12 feet high at the south end. It is much broken down about the margins, and is not far from 120 feet long and 30 feet wide at the top. The building probably fell a little short of these dimensions. Remnants of the walls stand toward the south end to the height of 10 feet, but the facing is all gone, leaving the rough masonry wall or hearting exposed and tottering. The middle opening of the triple doorway, rendered stable by its heavy piers and massive though shattered lintel, is still standing. At the north end, where the walls are entirely removed, the margins of the cement floor, which was polished and painted red, outcrop from the heap of debris. The chamber was upwards of 20 feet wide, and its roof was supported along the middle by a line of five columns, two of which still stand. The others have been removed; one lies in the court, and two form pillars for a porch to the curate's residence, as already described. Some writer has stated that still another column stands in front of a building in south Mitla, but I was not able to confirm this.

The west building, now represented by an oblong, mound-like mass, was evidently nearly identical with that on the east. The cement floor is still preserved to nearly its full dimensions, and upon this are piled up portions of the debris of the superstructure. A careful examination of the floor surface would show us whether or not columns were formerly planted along the middle, but from the very considerable width of the floor, which, unfortunately, I failed to measure, it seems that columns may have been required for the support of the roof.

The south structure is in a still more advanced state of ruin, and is divided near the middle by a depression, possibly of recent excavation, through which access is gained to the court. The original walls of the terrace, minus the cut stone facing which probably covered them, are preserved at the east and west ends, and partly on the south, to nearly the full height. There is no reason to doubt that



FACADE OF HALL OF THE SIX COLUMNS

PL. XXXI. FAÇADE OF HALL OF SIX COLUMNS.

This view is made up of three photographs taken from as many points near the southern margin of the court. The negatives vary slightly in scale, and the continuity of horizontal lines is interfered with as seen in the lower course of masonry, though the defect has been partially remedied by retouching. The full length of the building is 133 feet and the height in places is upwards of 14 feet. The full height was probably not far from 16 feet, as two or three courses of the coping stones must have been removed. The stairway and the low, narrow esplanade that extended along the front are nearly obliterated or are obscured by accumulations of debris. A breach in the wall at the right has been repaired by the authorities, giving it the appearance of a window opening. The columns within are so placed that they are not visible through either of the doorways, but the wall niche and part of the opening into the passageway that leads to the north court are seen.

Photograph by E. H. Thompson.

this terrace was closely similar to the others and supported a similar building, though there is nothing to show whether it was of double or single width. It is highly probable that in form, finish and decoration the east, west and south buildings were very similar to the north building, described in the succeeding paragraphs.

HALL OF THE SIX COLUMNS. Facing the court E on the north is one of the best preserved of the Mitlan buildings. It is of the usual oblong shape and contains but a single chamber, while back of it to the north and connecting with it is the closed Quadrangle of the Grecques, D. We have thus a compound structure which is usually regarded as a single building; but for the sake of clearness of description, I shall treat it as consisting of the five buildings which it theoretically embodies—the north building of the middle quadrangle and the four buildings of the north quadrangle. The platform occupied by this composite structure is a single mass composed of the usual rubble, and is hardly more than 6 or 7 feet in height at any point. The upper surface projects 4 or 5 feet beyond the walls of the superstructure, forming a narrow esplanade. This space had a cement floor, fragments of which are preserved in protected spots, and I observed that the nearly vertical front of the terrace has been faced with cut stone, portions of the lower course being still in place.

The superstructure is seen to good advantage in the panorama. The walls are preserved nearly to their full height all around, but the roof has entirely disappeared as well as one or more courses of coping stones. The three zones of mosaic panels can be followed entirely around the building save where interfered with by the doorways. In the panorama we look along the south front which faces the court and observe that its three squarish doorways give entrance to a long hall in which the tops of six columns are seen. The interior view is more effectively presented in the photograph reproduced in Pl. XXXII, which was taken from the top of the wall at the east end of the hall.

The grand though low and somewhat monotonous façade is shown in Pl. XXXI, which is made up of three views taken by Mr. Thompson from as many points of view within the court and joined to form one view. The photographs are not as brilliant as could be desired, and do not join with exactness, but the view will be useful to the student who wishes to study the various features in detail. This façade is 133 feet long and 14 feet in height; it is rendered especially noteworthy by its three fine doorways with their great sculptured lintels and massive piers, by twenty-three panels of handsome mosaic

fretwork, and by four deep pittings drilled in the pillar caps at the sides of the doorway and supposed to have served for supporting the timbers of an awning. Facing the observer in the panorama (Pl. XXXVIII) we have the east end of this structure; its three long grecque panels are broken down through the middle, but I have filled them out in order that a better idea of the building may be given. The opposite end is complete and is identical in every way. On the right, and set back some thirty feet, is the east wall of the annexed quadrangle (D) with its nine panels. The corresponding walls on the west side duplicate these, and the three sections of wall facing north have also nine panels each. There are, therefore, fifty-three exterior panels of fretwork in this entire structure or cluster of buildings. It is observed that the top courses of the walls are for the most part missing, and the facing stones along the base of the walls and most of the facing of the supporting terrace have been removed by modern house-builders.

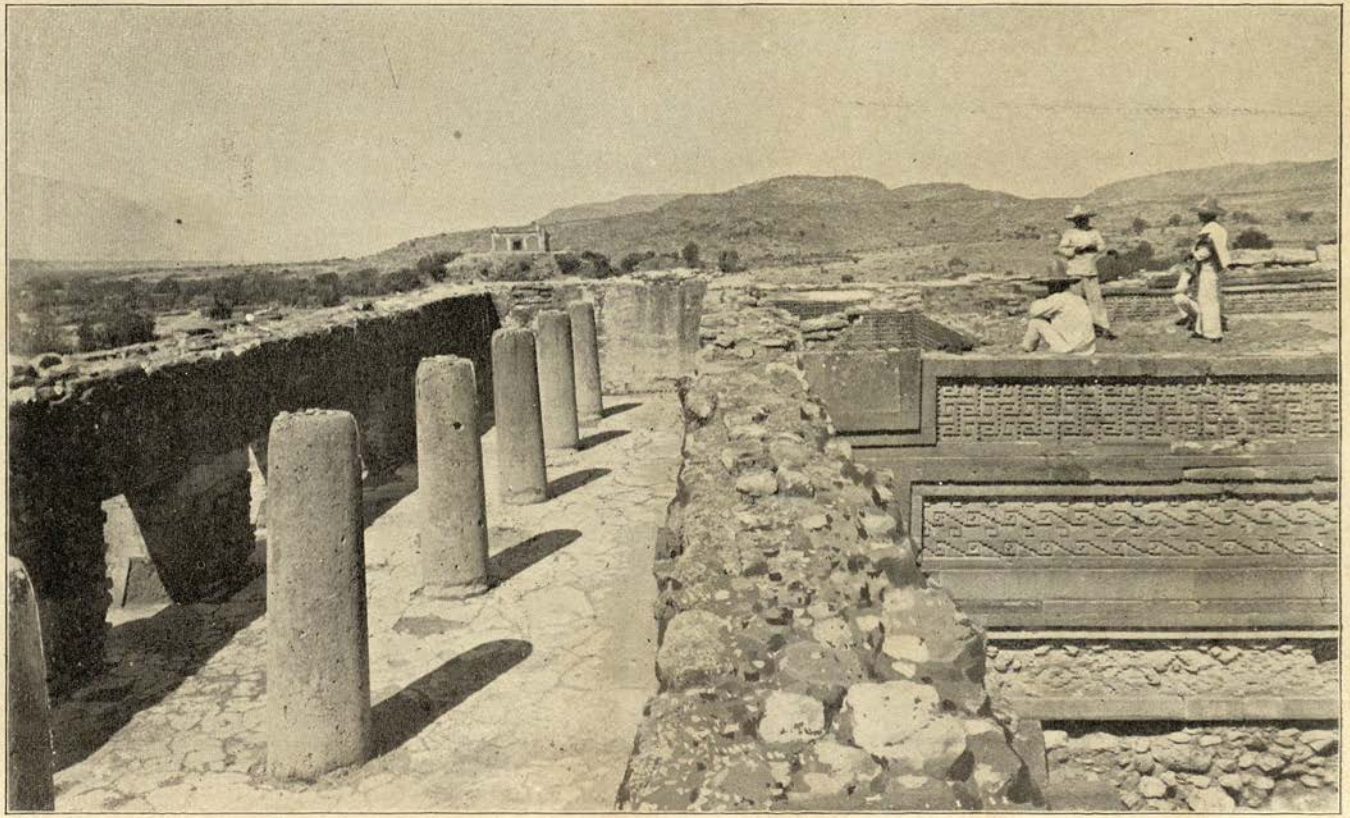
Entering the Hall of the Six Columns from the court (E) we observe the monotonous interior walls broken only by the three front doorways, by a smaller back doorway leading to the north court, and a recess or niche 17 inches high, 30 inches wide and 23 inches deep, placed in the center of the north wall opposite the entrance. It should be mentioned that the Mexican authorities some years ago, finding these walls much weathered out and liable to fall, undertook to repair them. As flattish red brick were employed—in the main at least—in this work the visitor need not be deceived as to the parts thus tampered with. As to the plaster of the walls and floor, it is somewhat difficult to say just what part is original and what is restored; but there seems to be little doubt (unless the entire wall surface has been replastered) that the walls were plastered originally and not finished in mosaic panels as in the chambers of the annexed closed quadrangle. The present appearance of the floor and walls is shown in Pl. XXXII. The great feature of this fine hall, which is 23 feet wide and 125 feet long, is the row of six columns arranged symmetrically along the middle. These columns are very well preserved and uniform in height and position. They are about 3 feet in diameter near the base, tapering a little toward the top, and vary but a few inches from 11 feet in height. They must be deeply planted in the substructure, as indicated in the section, Fig. 92, and their office was undoubtedly that of supporting the roof. Their height is about such as to permit of the use of longitudinal timbers, after the manner shown in the figure. Possibly there may have been capstones, as suggested in the auxiliary figure at *o*, but the only column in Mitla still supporting its original burden

PL. XXXII. INTERIOR OF HALL OF THE SIX COLUMNS, FROM ABOVE.

This view looks west from the northeast corner of the wall and shows the columns planted along the middle of the floor, the front wall in shadow at the left with the doorways indistinctly displayed, the north wall in the center of the picture, and the annexed quadrangle at the right. Of the latter structure we see part of the east wall (exterior), with its grecque-panels; we also get glimpses into the court at the right of the figures in white, and into the south and west grecque chambers at the left of these figures.

In the middle distance is the small church surmounting the principal pyramid of the Adobe Group, and in the distance, near the middle of the picture, the Fortified Hill.

Views of modern Mitla (obscured by foliage), and of the valley of the Rio Mitla are obtained at the left. Height of columns, 11 feet; width of hall, 23 feet. Photograph by A. V. Armour.



INTERIOR OF HALL OF THE SIX COLUMNS, FROM ABOVE.

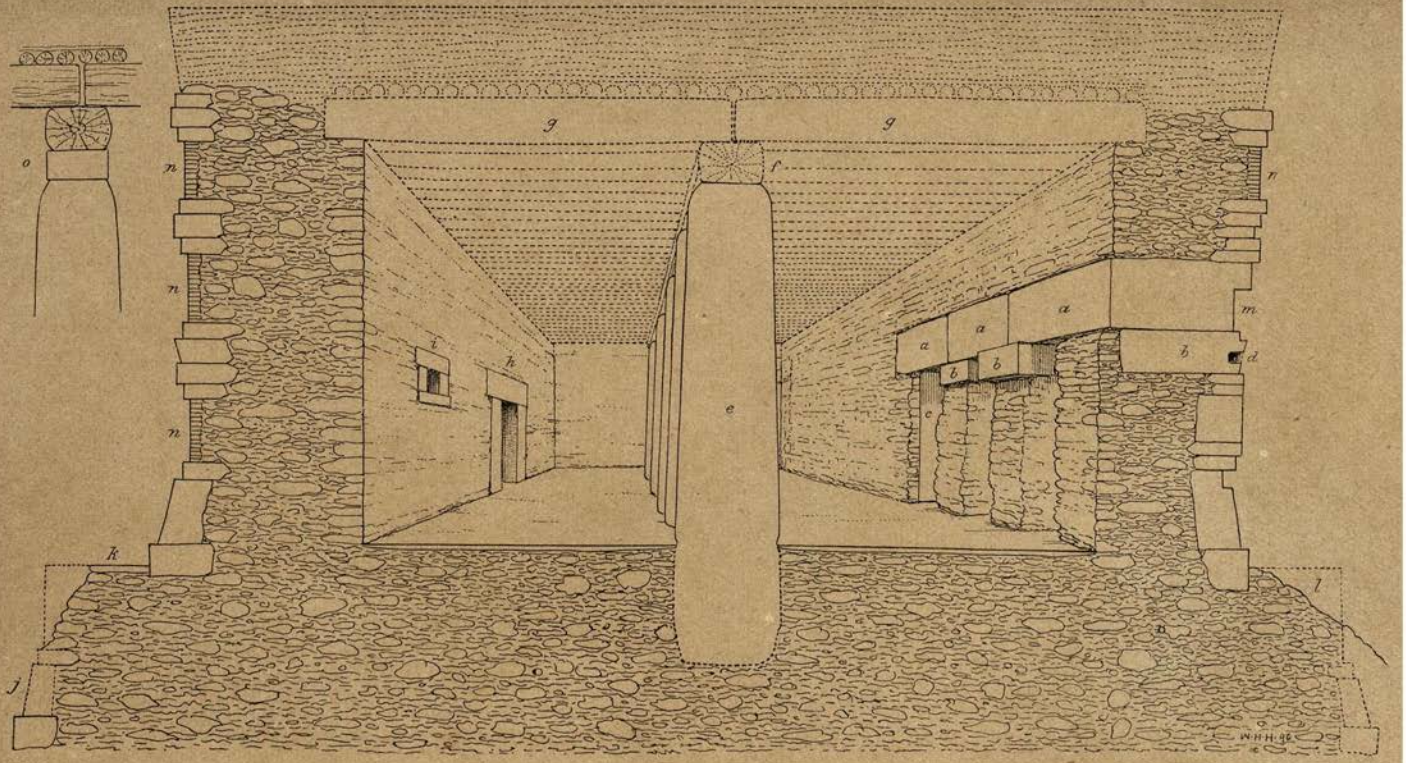


FIG. 92. SECTION AND PERSPECTIVE OF THE HALL OF THE SIX COLUMNS; LOOKING EAST.

Width of chamber, 23 feet.

a, a, a. Lintels of triple doorway.
b, b, b. Capstones of piers and jambs.
c. Jamb-stone, falling short of thickness of wall.
d. Socket for awning or roof timber.
e. Column, 11 feet 2 inches high (from floor).
f. Longitudinal beam (restored).
g, g. Cross beams (restored).
h. Entrance to passage leading to north court.
i. Wall-niche.
j. Partial restoration of terrace facing.
k, l. Esplanade.
m. Decorated lintel space.
n, n, n. Mosaic panels.
o. Indicating possible use of capstone.

is without this feature. That wood ceiling beams were used in this group of buildings is clearly proved by traces left in the northwest corner of the associated quadrangle and referred to farther on.

Details of the inner facings of the front doorways, of the niche and the rear door leading to the northern court, are shown in Fig. 92. The great lintels are somewhat rough on the inside, and were probably faced with plaster. The eastern jamb of the east opening and the western jamb of the west opening of the doorway were each faced with a thick slab or block of stone, the eastern one only remaining. The two piers have large capstones, but only one of these extends through to the inner face of the wall. The piers are otherwise composed of ordinary masonry and the surfaces were faced up with plaster. Within the doorways, portions of the polished and painted surfaces still remain and in the better protected parts slight traces of painted figures are seen. The niche in the back wall is framed in with cut stones, and the entrance to the passage into the north court is treated in like manner.

QUADRANGLE OF THE GRECQUES. The northern annex of the Hall of the Columns is a consolidated quadrangle with its court and four buildings; the latter take the character of chambers, but at the same time retain the usual relation of buildings to the court. These chambers are entered by doorways which in this case are single instead of

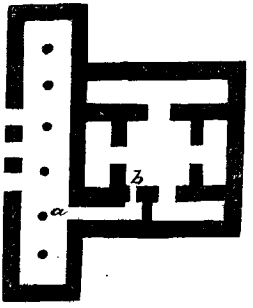


FIG. 93. SKETCH PLAN OF HALL OF SIX COLUMNS AND THE ANNEXED CONSOLIDATED QUADRANGLE OF THE GRECQUES.

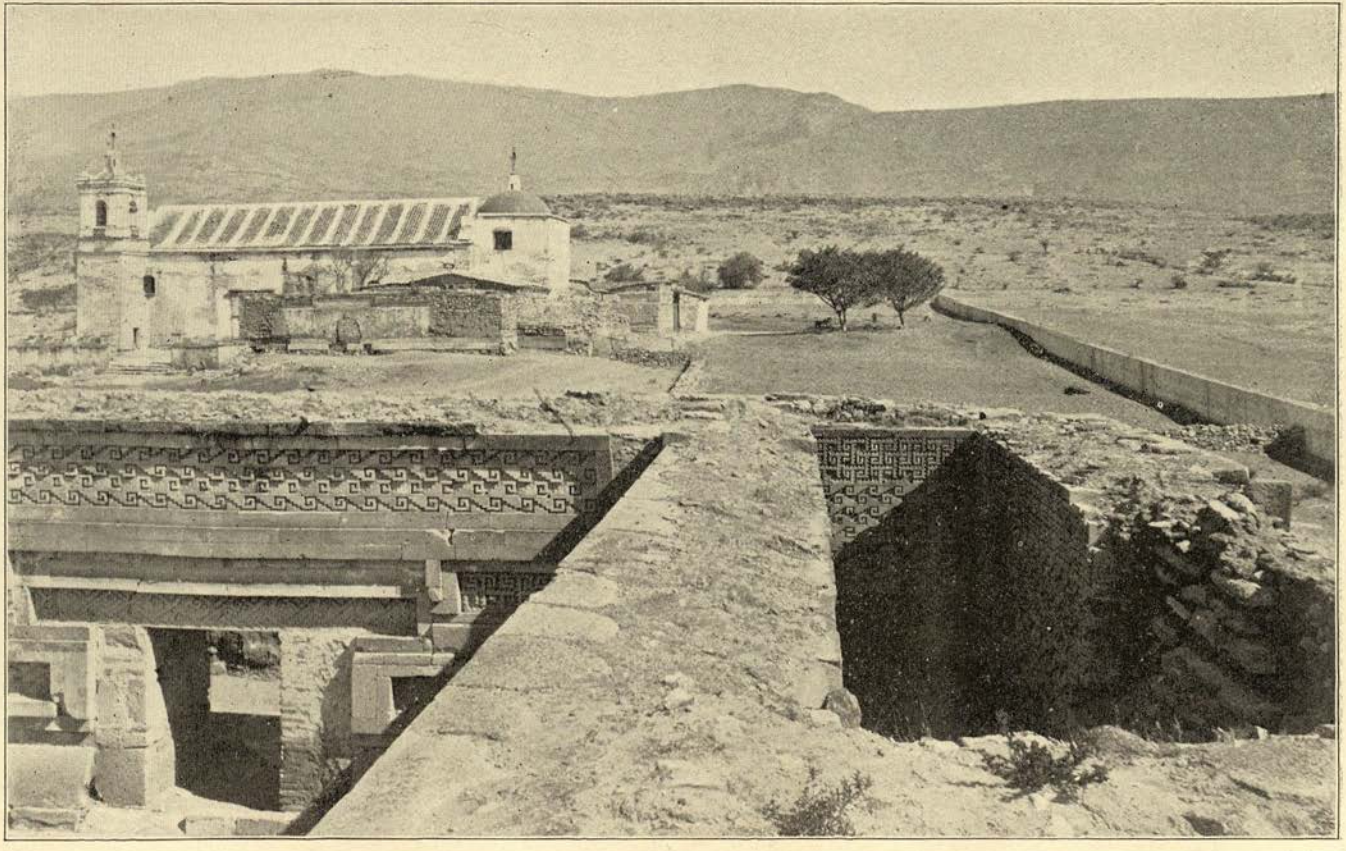
a-b. Passageway from Hall of Columns to Court of Grecques.

triple—a result, no doubt, of the limited space available. The ground plan shows considerable lack of symmetry resulting from crowding together of the four buildings and the introduction of the long, narrow passageway connecting the Hall of the Columns with the court, (Fig. 93). A study of this plan in connection with the section given in Fig. 94 will, I believe, afford a correct notion of the

PL. XXXIII. COURT AND EAST CHAMBER OF THE QUADRANGLE OF THE GRECQUES.

In this view we are looking north from the roof of the narrow entranceway. At the left is a glimpse into the court with the doorway into the north chamber showing recent masonry jambs, and at the right very much in shadow is the east chamber. An excellent idea is obtained of the thickness of the walls, and the shape of the coping stones. The chamber is 6 feet 6 inches wide and the walls are but little less than this in thickness.

Beyond is the group of the Church Establishment, with the modern church rising out of the half demolished ruins. Behind this group we see the low, bush dotted trachyte bluff, and in the distance the great ridge bordering the valley on the north. Photograph by A. V. Armour.



COURT AND EAST CHAMBER OF THE QUADRANGLE OF THE GRECQUES. CHURCH ESTABLISHMENT GROUP IN DISTANCE.

character and construction of this peculiar entranceway. The exterior appearance of the opening from the Hall of the Columns is shown in Fig. 92. Entering this portal, which is 3 feet 6 inches wide and 5 feet 6 inches high, we follow a passage of like

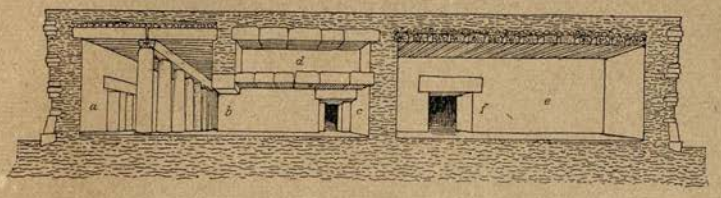


FIG. 94. SECTION AND PERSPECTIVE OF THE COMPOSITE GROUP USUALLY CALLED PALACE NO. 1; LOOKING WEST. ROOF RESTORED.

a. Hall of the Six Columns.
b, c. Passageway from Hall of Columns to Grecque Courts.
c. Entrance to Grecque Court.
d. Supposed space over passageway; ceiling construction theoretic.
e. East grecque chamber with doorway into Grecque Court.

dimensions (save that it is a few inches higher) 23 feet 10 inches long to the south wall (*c*) of the east chamber of the annexed quadrangle, where we turn to the left and pass through a portal 3 feet wide and 5 feet 4 inches high into the court of the grecques at its southeast corner. The section cuts this passage from north to south and shows its construction and the interior conformation of the opening into the court. The ceiling is 16 or 18 inches higher than the lintels of the doorways, and the jambs and lintels as well as the ceiling stones are massive and well hewn. The walls are plastered and painted, and in some parts retain traces of the dark red, highly polished surface. I was unable to determine absolutely whether or not there is a hollow space (*d*) above this passageway, but my impression is that such a space exists. I observed that the roof surface showed traces of recent repair by the authorities, and portions of newly introduced timbers were visible. In Pl. XXXII the three figures of natives occupy this portion of the roof, and the right-hand figure is directly over the elbow in the passage. In Pl. XXXIII we have a glimpse into the east chamber with its grecque covered walls and into the court at the left. The group of the Catholic Establishment is seen in the distance in this plate. The panorama gives a more connected though less interesting view of most of these features.

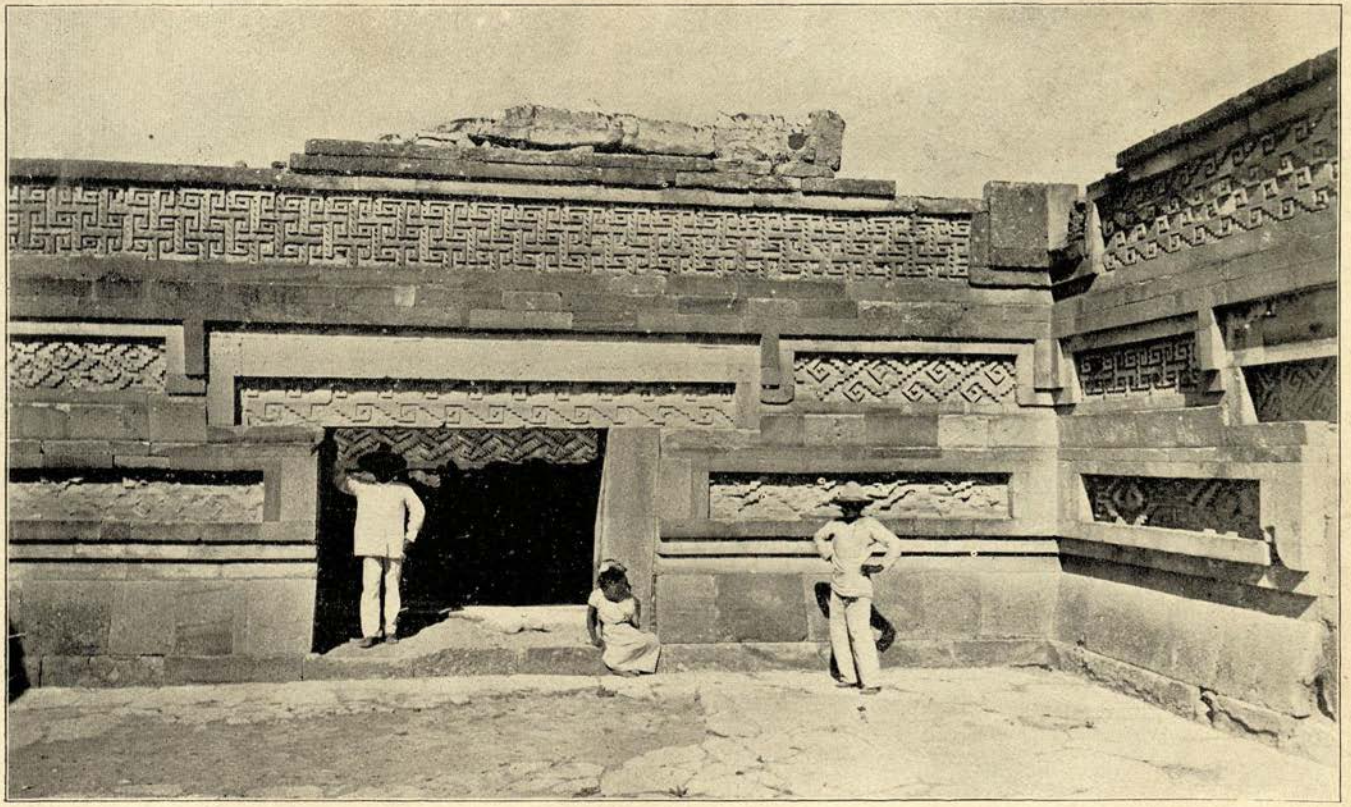
The court of this quadrangle is about 30 feet square, and the walls are well preserved to a height varying from 12 to 14 feet. There are five doorways, four opening into the four halls of the quadrangle, the fifth leading into the entrance passage just described.

The floor is cemented and shows no traces of the former presence of any architectural features. The walls are richly ornamented with fretwork panels framed in with courses of cut stone set now forward, now back, forming tasteful effects. There are eight panels on the lower line at the sides of the doorways, the southern one on the east side—interfered with by the entrance doorway—being shorter than the others. There are eight panels above on a line with the lintels, and four grand panels at the top extend each nearly the entire length of the wall occupied. The great lintels have each a narrow recess cut into the lower half of the face extending nearly the full length; these recesses are decorated with sculptured grecques which repeat the mosaic patterns of the walls. The lintel over the west doorway (see Pl. XXXIV) is 12 feet 6 inches long, 30 inches high and 36 inches wide, and the others have closely corresponding dimensions. All the door jambs but one have been removed or destroyed, and pillars of masonry have been inserted in some cases by government order to keep the cracked lintels from falling (see Pl. XXXIII). The remaining jamb-stone, against which the child sits in Pl. XXXIV, is a finely cut slab 5 feet 4 inches high (the height of the door), 3 feet 7½ inches wide (the depth or distance through the door), and 16½ inches thick.

The four rooms to which these four doorways give entrance are marvels in their way, the walls being faced—save a plastered dado 4 feet 6 inches wide—with solid mosaic, consisting of the most perfect and charming fretwork. The section (Pl. XXXV) gives a good idea of the construction of the walls which separate the court from the side halls and indicates the vertical extent of the panels of fretwork. Details of the construction of the mosaic are given in another place. We gain some idea of the amount of work involved in decorating one of these rooms by computing the total number of pieces of hewn stone employed. In the west chamber, for example, this number (only an approximation, of course) I find to be 14,690. The other rooms are smaller, and would average perhaps 8,000 each. The twenty panels of the same work in the court and the fifty-three panels of the exterior walls of the structure—seventy-three in all and estimated to require 600 stones each—would aggregate 43,800 pieces. We would thus have in this quadrangle a total of 81,800 mosaic stones, many of which are of complex and varied shape. If the Hall of the Six Columns was finished originally as were the rooms of the north quadrangle, the whole number of mosaic stones in this cluster of chambers would certainly exceed 100,000; and if we were to add to this number all that would be required in the remainder of the group, and in the

PL. XXXIV. IN THE COURT OF THE QUADRANGLE OF THE GRECQUES.

We see here portions of the west and north walls facing the court, and get an excellent idea of the long grecque-panels over the doorways, and the smaller panels below. A small portion of the farther jamb of the north doorway is seen at the right, and the fine doorway giving entrance to the west hall appears at the left. The great lintel is well shown, with its smooth surface above and the sculptured grecque-panel below. At the right, behind the figure of the child, is the only remaining jamb-stone. Surmounting the wall over the doorway is a remnant of the concrete coping with a roundish opening at the right which has caused no little speculation as to its use. The width of the doorway as it stands is 6 feet. Photograph by A. V. Armour.



IN THE COURT OF THE QUADRANGLE OF THE GRECQUES.

three great groups which are so much like this one in their general style—supposing all to have been similarly decorated—the grand total would hardly fall short of a million.

The west chamber of the grecques is the best example of the Mitlan interior, and in Pl. XXXV I have undertaken to present a complete idea of its appearance and of the construction of its walls and roof. Taking the excellent view made by Mr. Thompson, which looks north from near the south end, I have framed it in with a section showing every detail of construction. The floor is neatly cemented though now not quite level. The dado is of masonry formerly smooth-finished in plaster, the surface remaining in some parts. Above are the three bands of geometric mosaic, bordered at the top and bottom by narrow courses of hewn stone; the manner of inserting the

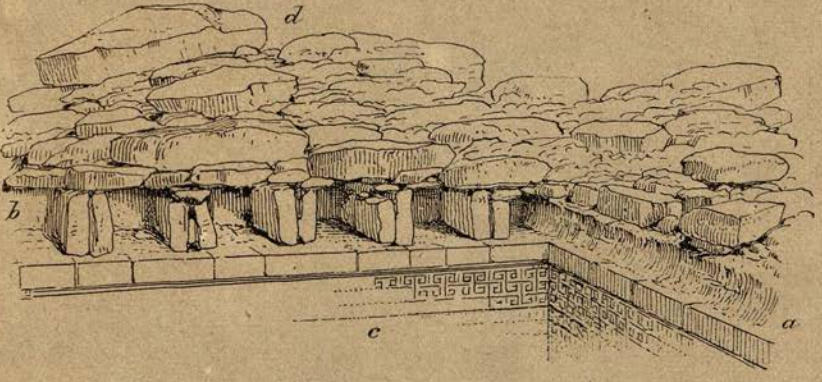


FIG. 95. DRAWING SHOWING BED AND SOCKETS OF CEILING BEAMS.

a. Imprint of rounded surface of log in mortar bed.
b. Line of sockets from which beams have been removed.
c. Interior wall of grecque chamber.
d. Loose stones of top of wall.

various parts is shown in the section. The doorway opens into the court in the middle of the wall at the right; above it is the massive lintel with the flat grecque sculptured face next the chamber, and the notched front, also grecque sculptured, facing the court; the section appears at *d*. Across the top a single ceiling timber is introduced and the roof construction is suggested in broken lines. The warrant for this manner of inserting the beam is found at the north end of the chamber where the interior wall surface retains its full original height and the bed of the end beam is still plainly visible. The rounded side of the log has left its imprint in the mortar across the end of the chamber and the sockets where the ends were inserted appear at the right and left. I have prepared two drawings (Figs. 95 and 96) to

further illustrate this phase of the construction. In Fig. 95 we see at the right the imprint of the end beam and the socket into which the farther end was fitted, while other sockets appear at the left extending to *b*. The beams were laid across from wall to wall as indicated more clearly by the dotted lines in Fig. 96, *g*, *h*, *i*; they were about 10 feet long, 12 inches wide and 8 or 9 inches thick and were separated by spaces of 6 or 8 inches. These spaces were filled in at the ends by stones set on edge, as indicated in perspective in Fig. 95 and in plan in Fig. 96.

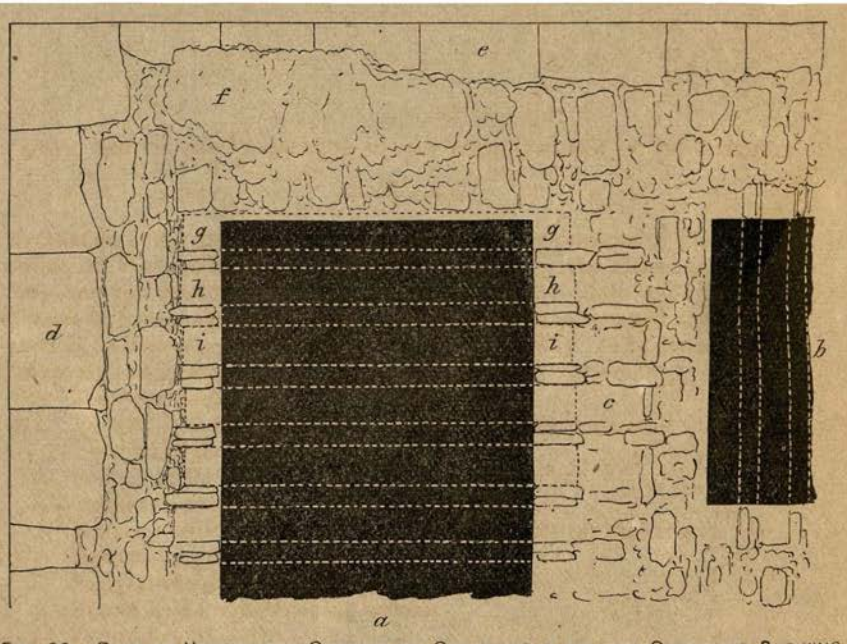


FIG. 96. PLAN OF NORTHWEST CORNER OF QUADRANGLE OF THE GRECQUES, SHOWING THICKNESS OF WALLS AND PLACEMENT OF CEILING BEAMS.

a. West chamber with dotted lines indicating beams.
b. North chamber with dotted lines indicating beams.
c. Wall separating north and west chambers; 4 feet 4 inches thick.
d. Upper course of facing stones of west wall.
e. Upper course of facing stones of north wall.
f. Remnant of concrete roof surfacing.
g, *h*, *i*. Beam sockets.

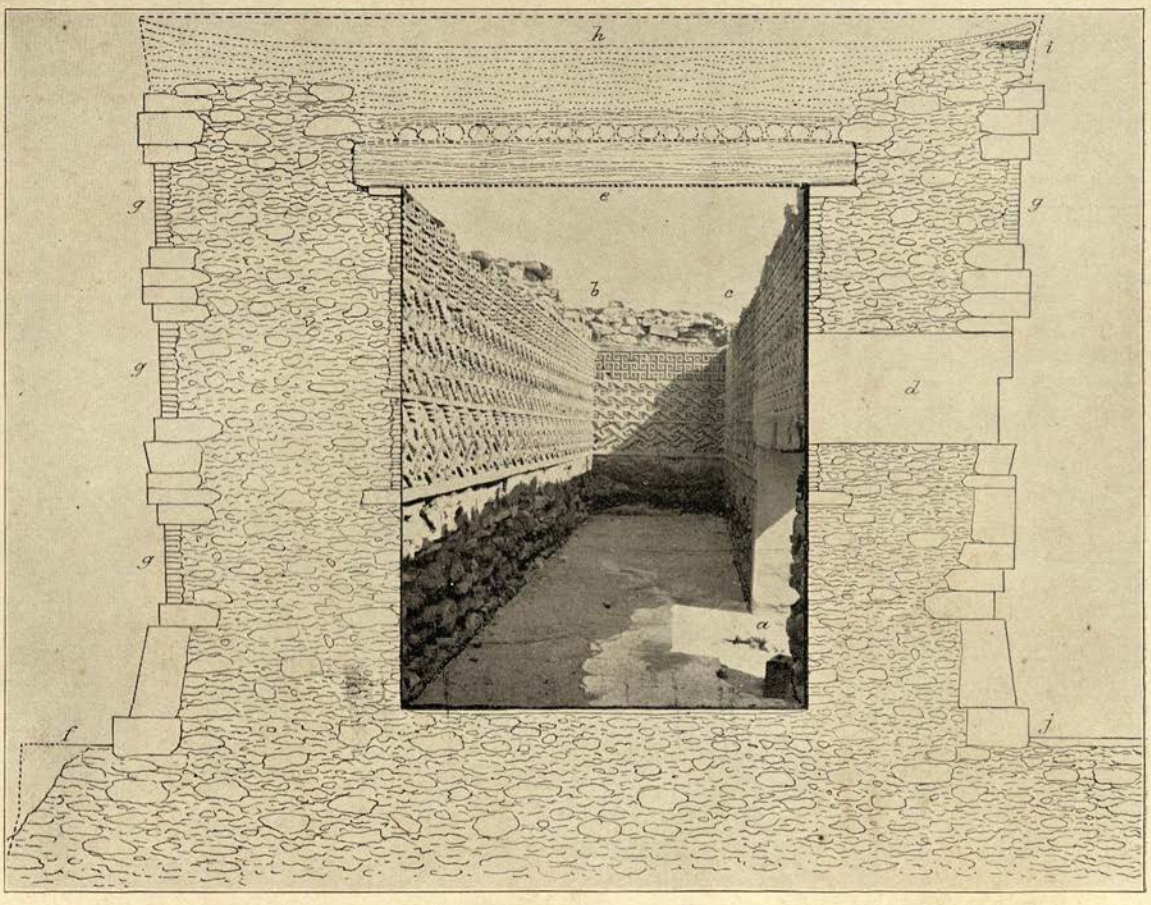
In the section (Pl. XXXV) the character of the walls is expressed with as much accuracy as possible. The outer wall at the left is about 5 feet thick and the courses of stone alternating with the mosaic panels (*g*, *g*, *g*) are given in nearly their true proportions, the broken down esplanade appearing at *f*. The inner wall facing the court is from 3 to 4½ feet thick and is faced with courses of hewn stone

PL. XXXV. SECTION AND PERSPECTIVE OF THE WEST CHAMBER OF THE GRECQUES.

Section and view are combined in this plate for the purpose of giving a complete idea of the construction. We look north along the chamber, with the doorway into the court at the right. The walls have a plain dado below, and three zones of grecque mosaic above; these features come forward and appear in the section, as does also the lintel spanning the doorway. The foundation and wall masonry are shown, and ceiling beam and roof are restored.

a. Doorway into court.
b, *c*. Portion of the roof masonry surmounting the north wall and showing socket of the end ceiling beam.
d. Section of lintel.
e. Beam restored in accordance with socket.
f. Exterior esplanade, 6 feet high and 5 feet wide (approximate).
g, *g*, *g*. Sections of grecque panels.
h. Suggestions of level and convex roofs.
i. Round hole through coping cement.
j. Floor of court.

It is possible that the walls as shown are somewhat too thick below. At the points measured the inner wall was 4 feet 4 inches thick and the outer wall 5 feet 6 inches thick. Width of chamber, 8 feet. Photograph by E. H. Thompson.



SECTION AND PERSPECTIVE OF THE WEST CHAMBER OF THE GRECQUES.

alternating with mosaic panels as is the outer wall; the section here presented, however, cuts so near the doorway that only the upper panel is included. The top of the wall at the right in the section presents the characters observed, not at the point cut by the section, but at the farther end of the chamber where a portion of the cement surface of the roof is preserved; this surface slopes inward with a slight curve as indicated at the left of *i*. The coping course is lost from this upper portion, but at one point at the level of *i* a round opening is seen in the toppling remnant of concrete, which suggests that if the roof sloped inward all around, as indicated in the sketch, it may have been drained by a pipe at *i* into the court. The remnant of concrete with the opening referred to is seen in Pl. XXXIV over the head of the right-hand standing figure.

QUADRANGLE OF THE BASEMENT GALLERIES. Immediately to the left of the Quadrangle of the Columns, as seen in the panorama, is the southern quadrangle of this group with its three partially preserved buildings and a ridge of debris representing the substructure of the fourth. The walls of the north, east and south buildings stand to nearly their full height, but the roofs are entirely gone, and the cut stone facing of the walls is nearly all removed exposing the rough masonry of the hearting; from this the dark adobe mortar is fast falling out promising collapse to the greater masses. It is clear that in these buildings, as in the others, the removal of the lower and more accessible courses of facing stones by modern house-builders has contributed vastly to hasten the destruction of the great buildings. In the panoramic view we see facing us the outer wall of the east and principal building with its remnants of mosaic panels, and get a glimpse within of the lintel stones of the triple doorway which opens into the court. These lintel stones are the largest seen in Mitla. Beyond at the right a view is obtained of the north building with its three doorways seen from within, and at the left is the south building with its much mutilated façade.

The substructures retain their form somewhat fully but no facing is seen, and, robbed of their superstructures, they would be merely oblong mounds of crumbling rubble masonry. Along the south side they are from 12 to 15 feet high, but at the north are hardly half that height. The south end of the east building is shown by Charnay in "Ancient Cities of the New World," p. 511.

These buildings stand well apart, but the terraces, which must have projected a few feet beyond the walls as in the more northern structures, probably approached quite near together at their inner corners, closing in the shallow court. This court is some 140 feet square and

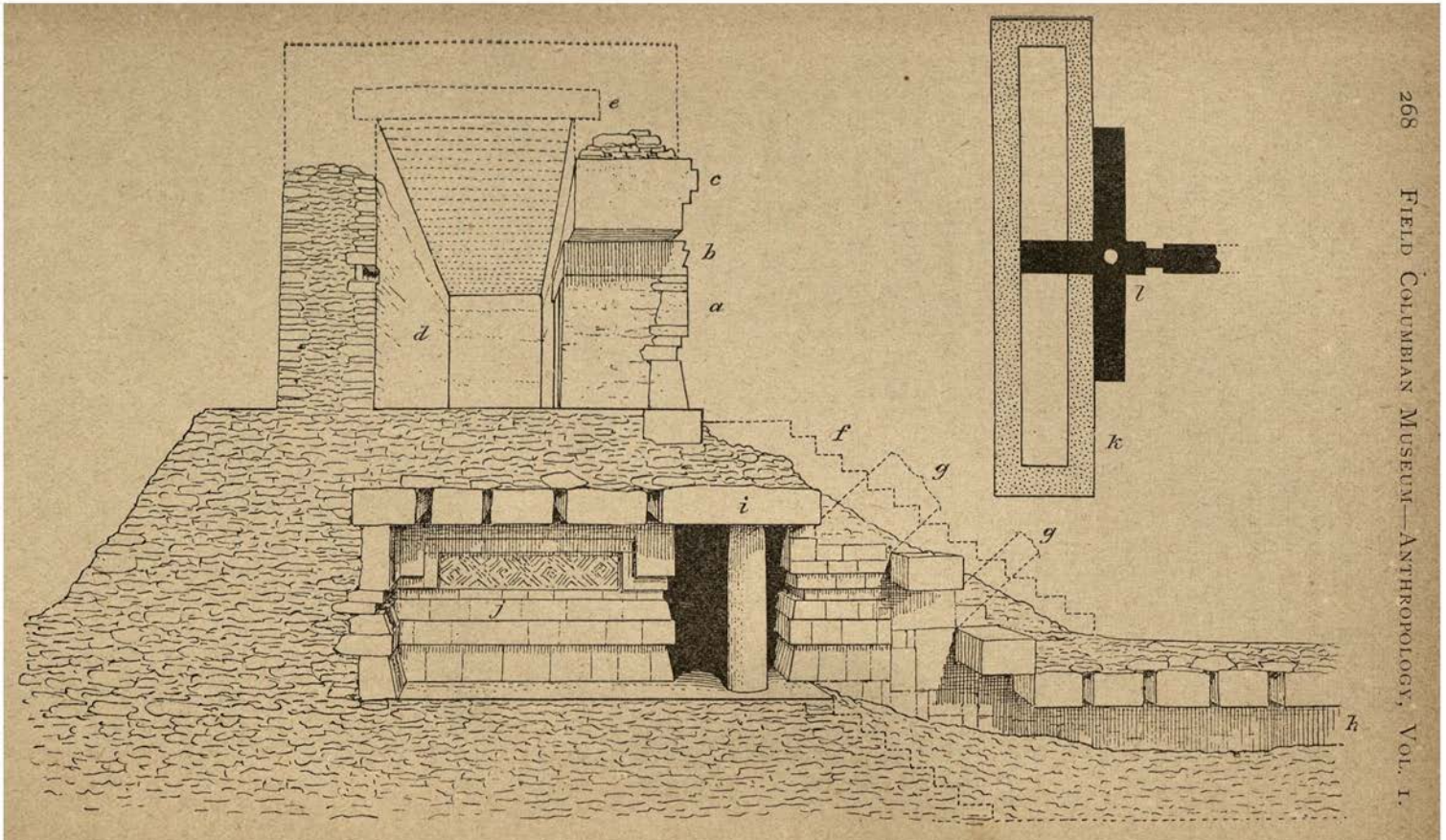


FIG. 97. SECTION AND PERSPECTIVE OF THE BUILDING OF THE BASEMENT GALLERIES.

The cruciform plan of the basement chambers appears in the annexed cut.

a. Doorway of building.
b. Capstone of pier.
c. Lintel.
d. Chamber.
e. Roof beams, restored.
f. Restoration of stairway
g-g. Openings made by removing ceiling stones.
h. Closed end of underground passage.
i. Ceiling stone supported by round column.
j. North extension of gallery.
k. Plan of superstructure.
l. Plan of basement galleries.

is now much filled in about the margins. The buildings were independent of the adjoining quadrangle, but the adjacent terraces were separated by a few feet only. In the sunken pathway between the north building of this quadrangle and the south end of the west building of the Quadrangle of the Columns, there are seen traces of the lower course of the terrace facings, which clearly show this proximity and at the same time indicate that the esplanades about the buildings were of the usual width of 4 or 5 feet.

The northern building possesses peculiar interest because of its basement galleries and underground passage (Fig. 97). The façade has no doubt corresponded somewhat closely with that of the Hall of the Six Columns. There are the same small panels of fretwork in the center of the pier fronts between the doors, the handsomely hewn stone framework, and the four holes for awning timbers in the pillar and jamb caps of the doorway. The squarish doorways and their noble lintels are almost perfectly preserved, as well shown in Bandelier's plate 23. They are 6 feet 6 inches high and 7 feet wide. The triple lintel, 45 feet long and 2 feet high, has no sculptured ornament, but shows traces of light colored paint. The jambs of the doorways have been painted dark red and polished and decorated—at least in part—with graphic subjects in black. The main walls, inner and exterior, show only the rough stonework, but the cement floor retains its dark red finish. The niche occupies the usual place in the back wall. The length of the hall is 83 feet and the width 8 feet. The height of the ceiling and the finish of the walls have no doubt corresponded closely with like features in the buildings of the Quadrangle of the Columns.

Viewing this building from the center of the court we observe, in the slope (formerly the stairway) directly beneath the center doorway, two oblong horizontal openings in the masonry, and get glimpses through them of a round stone column. This column occupies the point of intersection of the two galleries forming the mysterious basement story of the building. I doubt if originally there was any opening at this point, as it would have interfered with the stairway, and the idea of complete darkness—the result of closing those openings—would, it seems, not have been repugnant to the ancient peoples. Entering by an opening at the left where the masonry is considerably broken down, we stand beside the column. As seen in the ground plan, the intersection of the galleries occurs beneath the esplanade and a little in front of the middle doorway, the relations of the various features being clearly shown in Fig. 97. The entrance was by a subterranean passage (the stem of the cross in the plan) approaching

from the center of the court, and this, rising (presumably by several steps) to the level of the basement galleries, has its continuation beyond the column in a gallery 12 feet long, 5 feet wide and 6 feet 6 inches high. The entire length of the cross-arm, which runs east and west beneath the esplanade, is 42 feet; the width and height are the same as in the north gallery. The round column stands a little forward of the center of the intersection of the arms, and is 21 inches in diameter, 6 feet 2 inches high, and tapers slightly toward the top. It is somewhat mutilated as shown in Pl. XXXVI, which is a view looking west with the exit to the left. It supports two great ceiling stones, which are dressed smooth on the under surface, though they are rough on the edges and probably also above. They are from 12 to 20 inches in thickness and between three and four feet wide. The column is absolutely essential to the support of these stones. The ceiling stones of the three galleries and the entrance passage are similar in character but narrower. They are set a few inches apart, and by looking up between them one can see that rough stones extend along the apertures supporting the thick rubble mass of the floor above. The entire thickness of this floor between the ceiling surface and the surface of the floor of the superstructure is about 5 feet, as indicated in the section, and readily demonstrated by referring to a photograph of the front of the building, published by Bandelier.*

The walls of the apartments are neatly finished in every way and decorated with panels of fretwork resembling those of the exterior of this and other buildings. The work is a little heavier than in other cases, and the figures are arranged in somewhat peculiar ways, but all are much alike in motive and execution. The character of the framework of the panels and the wall space below is indicated in the section, and is clearly shown in the photograph reproduced in Pl. XXXVI. The sides of the entrance to the underground way are faced with cut stone in the usual style of exterior surfaces. The ceiling descends in steps, as indicated in the section, until the level of the passage ceiling is reached—a little lower than the floor of the galleries. The stairway is destroyed or covered up, and the passageway is so filled with debris that only a foot or two of open space remains next the ceiling. By crouching low one may see into the passage 10 or 15 feet. About 6 feet from the column the side walls contract a few inches, and then a little farther on expand to 3 feet 6 inches, so that the passage is narrow, and its height was probably not more than 5 feet. Of course it is useless to speculate as to the nature of the remainder of this passage; I incline, however, to the view that the entrance was located somewhat near the center of the

* Mexico, pl. XXIII.

PL. XXXVI. BASEMENT GALLERIES AND COLUMNAR ROOF SUPPORT.

In this view we look west along the gallery which extends beneath the stairs and esplanade in front of the north building of the Quadrangle of the Basement Galleries. The light comes in at the left through an opening recently made in the roof of the passageway under the court. The column supports heavy ceiling stones, and stands at the intersection of the north and south with the east and west galleries. The opening of the north gallery, seen at the right of the column, is directly beneath the central doorway of the building above. The paneling and masonry are seen at the right. Height of column, 7 feet.

BASEMENT GALLERIES AND COLUMNAR ROOF SUPPORT.

court. By reference to one of Dupaix's plates (Kingsborough, Vol. V.) it will be seen that the walls of the passage are ornamented with mosaic fretwork in the usual style. It is also seen that the artist who made the drawing had reason for indicating the termination of the passage at the distance of perhaps 15 feet from the intersection of the galleries. Whether a stairway led up to the surface at this point or whether there was a turn or other feature cannot be determined until the Mexican authorities decide to undertake further investigations. It seems to me highly probable that the galleries were devoted to mortuary uses.

The east building has been a noble structure, corresponding closely in size and appearance with the wider structures of the Quadrangle of the Columns. The length of the apartment is about 120 feet and the width 22 feet. The latter measurement indicates the probable use of columns for supporting the roof timbers, as in the Hall of the Columns, though no traces of these are now visible, and the floor shows no sockets into which columns could have been inserted. It should be remembered in this connection, however, that these chambers have almost certainly been used by post-Spanish residents, and that the floors, if defective, would have been subject to recementing. Indeed it is hard to say of any of the floors in the better preserved buildings that they are certainly aboriginal. I may add that to me there seems no apparent reason why pillars of wood instead of stone should not have been used in supporting the roofs of these buildings. The walls are almost completely denuded of their cut stone facing, save on the south and east exteriors where large portions toward the top, beyond the easy reach of vandals, remain in place. The fretwork panels, of which there are only two zones in place (see panorama), are identical in style with those of the better preserved Quadrangle of the Columns. Two fine panels, about 25 feet in length, ornament the south end, and six, preserved in whole or in part, remain on the east wall. Over this eastern wall in the panorama, the inside of the front wall and the tops of the three doorways are seen. The lintels spanning the latter are between 19 and 20 feet in length. The diversity in published measurements of these stones has probably resulted from the fact that the ends are uneven. The width is 5 feet and the thickness or height 3 feet 7 inches, not counting the elevations of the untrimmed upper surface. The doorways are 7 feet 8 inches high and about 8 feet wide. The jamb-stones—two only occurring, as usual, and these at the outer sides of the end doorways—are 7 feet 8 inches high, 5 feet 5 inches wide and 3 feet thick. The capstones of the pillars are almost as massive as the jambs, and

there are some very heavy, roughly dressed stones built into the pillars. The cemented floor retains its red surface, and the sides and soffits of the doorways are painted red or a pale reddish tint. The three lintels, as in other buildings, are treated as a single stone, and the lower half of the face is recessed and filled with lines of fretwork, neatly sculptured and retaining pale reddish paint in protected parts. Small panels of mosaic fretwork appear on the pillar fronts, and there are also remnants of great panels, in the same style, above the lintel, and to the right and left of it.

The south building corresponds very closely with that on the north, the apartment measuring about 8 by 84 feet. The terrace rises 5 or 6 feet above the general level of the court and is from 12 or 14 feet high on the outside at the south. The walls vary from 10 to 12 feet in height and show only the rough, weathered masonry, save on the exterior, where a portion of the base course of dressed stone is still in place. The three great doorways and their massive lintels, jambs and pillar-caps are preserved, as indicated in the panorama which shows a considerable portion of the façade. At the back of the hall is seen also the mysterious, stone-framed recess.

GROUP OF THE ARROYO. The resemblance of this cluster of quadrangles in its leading characters to the groups already described is so close that detailed description seems superfluous, and the panorama and ground plan must be largely relied upon to tell the story. The group can be seen in the panorama over and beyond the quadrangle last described. There are three quadrangles, differing from those already described only in minor details of placement, plan and elevation. Like the buildings of the northern group, these structures rest upon the unchanged surface of the gentle slope. The walls are now nearly all reduced to the level of the great lintels, which are so heavy as to have caused a halt in the depredations of modern house-builders. The arroyo, some twelve feet deep, passes close under the east walls threatening their destruction, and the roadway skirts the group on the north and west. The north and middle quadrangles coalesce, while the southern one is set apart and to the west, and is separated from the middle quadrangle by a space of 6 feet. The courts vary but a few feet in their dimensions from the corresponding courts of the Group of the Catholic Establishment. None of the buildings seem to have been so wide as to require columns for the support of the roof. The outer walls of the north and east buildings of the northern quadrangle are leveled with the ground and the same is true of the walls of the southern buildings of the middle and south quadrangles—assuming that these structures once

existed. It is especially to be noted that the north court connects with the middle quadrangle by a dark, crooked passageway—as in the other groups—and that there are in none of the buildings traces of exterior doorways. The courts have communicated with their inclosing buildings by means of the usual doorways, the lintels of which measure from 10 to 15 feet in length, some being as much as 4 feet 6 inches wide and 3 feet thick. A remarkable feature of these lintels is the preservation in places of portions of painted designs which originally covered the entire sunken panel of the lower half. The best examples are found in the southern court, where the panel was a foot in width and about 36 feet in length, as shown in the sketch, Fig. 91. A small portion of the painted design from this lintel is reproduced in Fig. 90.

The walls have been faced with cut stone, as indicated at several points where destruction is not yet quite complete. They have been ornamented with fretwork panels, as in the other groups, and specimens of the dentate stones are scattered along the base of the walls.

GROUP OF THE ADOBES. This appellation expresses the chief distinctive feature of the group, of which portions of the mounds or pyramids on which the buildings stood are alone preserved. The east and north mounds are seen in the panorama over the Quadrangle of the Columns, E, and their position and relations with the group are clearly shown on the map. Without excavation we can learn little of the character of these structures or the nature of their surface finish. Though built chiefly of adobe, they may have been faced with cut stone and elaborately decorated with fretwork, as in other cases. The main mound shows traces of terracing and doubtless the others have been terraced, as indicated in a plate published by Dupaix. The eastern mound is much larger than the others, and probably supported the principal building. It is 30 feet high, and the summit, which is about 60 feet from east to west and 80 from north to south, is now occupied by a small Christian chapel of primitive design and construction. The north, east and south slopes are quite steep and much weathered and scarred, while the west side has been cut away by late occupants of the court and is vertical for two-thirds of its height. The adobe bricks used are about 15 inches long, 6 inches wide and 2½ inches thick, and are heavily bedded in a matrix of coarse adobe. The base of the mound is composed partly of stones irregularly imbedded in adobe soil, as in other examples.

The dimensions of the court cannot be accurately determined, but it must have been at least 150 feet square. The northern structure is now represented by an irregular mound of adobes, some 10 feet high,

20 or 25 feet wide and 40 or 50 feet long. The west mound is perhaps 80 feet long, 25 feet wide and 10 or 12 feet high. The south member of the quadrangle is reduced to a low ridge of earth. These remnants are being rapidly reduced by the present occupants of the site, and it is hard to believe that forty years ago they were as well preserved as indicated in the Dupaix plate. I had no opportunity to search for traces of possible associated groups, and shall only mention the occurrence of a large squarish block of stone a few yards beyond the mounds on the northwest.

SOUTH SIDE GROUP. At the extreme left in the panorama and beyond the steep banks of the Rio Mitla is seen a massive mound rising above the numerous clusters of dwellings and their accompanying masses of dark foliage. This is all that remains of a great structure that once formed the east member of a quadrangle identical in plan with those of the north side. Between this group and the

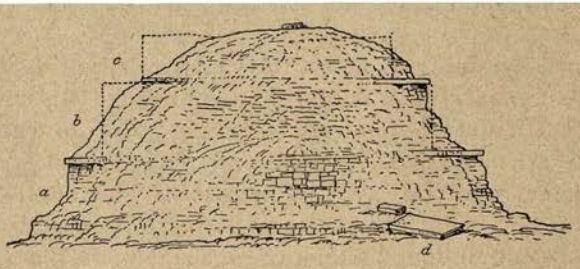


FIG. 98. SKETCH OF SOUTH END OF PYRAMID SHOWING CONCRETE FLOORS.
a, *b*, *c*. Terraces. *d*. Slab of concrete descended from above.

creek are traces of a second quadrangle, represented on the north and east sides by low mounds of earth and stones. This cluster lies directly north of the better preserved quadrangle and probably held to this group the same relationship that the northern buildings of the other groups held to their adjoining structures. Its presence suggests the possibility of a third quadrangle at the south; but so far as I know no traces of its presence have been noted.

The east member of the main quadrangle was probably one of the grandest of the Mitlan structures. The pyramid is nearly 30 feet high and at the base measures about 100 by 120 feet; the flattish summit preserves nearly its original dimensions, having been protected by a firm cement floor, and measures 60 by 80 feet; resting on this is a low mass of earth, about 5 feet high, having near the middle remnants of a Spanish building, probably a church. This massive pile is composed of stones of various sizes and shapes

imbedded in adobe, as in many of the north side structures, but we cannot at present say whether the facings were of stone or cement. The most noteworthy feature of this pyramid is the cement or concrete floors of the terraces, which are so firm and thick as to stand out in places far beyond the crumbling slopes, as shown in Fig. 98.

The terraces are about five feet wide, and probably extended entirely around the pyramid, save where interrupted by a stairway or stairways. These floors occur at the south end, as indicated in the sketch. At the base is a large slab of this flooring, some 7 feet long and 4 feet wide, which has fallen from above and remains intact and as firm as a slab of stone. It is 7 inches thick, and is composed of coarse, gravelly concrete, surfaced with finer mixtures. Portions of the masonry of the lower story at the south end are preserved, and some of the rough vertical wall of the second story is still in place. The floors have frequently been repaired by adding thin coats of cement, and after each application the surface has been painted red and polished.

The north pyramid was about the same in length as that on the east, but was much inferior in width and height. It is composed of stones and earth and is about 18 feet high, 30 or 40 feet wide and upwards of 100 feet long. The cement floor and portions of the walls of the superstructure are still in place. The length inside was about 80 feet, and the width 15 feet. A partition wall extended the full length of the building, dividing the space into two parts, one being about 5 feet wide and the other 8. Traces of cross walls occur in two or three places, indicating a separation into rooms of unequal size.

The west structure is represented by an oblong mound about 12 feet high and 25 feet wide at the top; its south end has been nearly leveled with the ground. The southern structure is still further reduced, and is represented by a low ridge from 3 to 5 feet high. The court is occupied by modern dwellings, and the work of destruction is going on at a rapid rate.

THE FORTIFIED HILL. One of the most unique and striking features of Mitla is the fortified hill, situated about a mile to the west of the village. Its position and general topographic character will be understood by referring to the panoramic view, and numerous details are given in the accompanying illustrations. The hill is an outlier of the highland facing the fields that border the stream on the north, and is separated from the adjoining bluffs and slopes by an encircling depression. It is a great mass of barren rock with a flattish top from which a spur descends toward Mitla at such an angle as to make the ascent quite easy. The summit proper, wholly occupied by the

fortification, is perhaps 400 by 1,000 feet in extent; the base is half a mile in length from southeast to northwest, but less than half as much in width. Viewed from the direction of the creek, a long, rather low face is presented, rising from the gently sloping field in a steep, even incline; this becomes rugged above and ends in an irregular, broken precipice, crowned by the walls of the fortress. On the west and north the sides are steeper and more rugged. Great bodies of the rhyolite rock are seen protruding at every point, while many masses, dislodged from the ledges above, surround the hill on all sides. Vegetation is sparse, and consists mainly of scrubby trees, cacti and brambles. A photograph made from the south shows so little of the crowning structures that it is not considered worth reproducing, but a view made from the rocky approach near the crest on the Mitlan side is given in Pl. XXXVII. This view is very unsatisfactory, but there is no point from which any more comprehensive view can be obtained. In the picture we see the outer wall crossing the crest from side to side, terminating in a great, detached, rounded rock at the right; beyond this is the second and higher wall, and we catch a glimpse of two piles of buildings occupying the higher position within the inclosure. I stood on the inner wall with my hat held aloft while Mr. Thompson made the view, and a definite idea of the proportions of the several features of the picture is thus conveyed. The gateway—or opening rather—in the first wall is at the left in the plate, and the passage through the second wall is a little farther to the left. Our visit was hurried and, as a second visit was contemplated, a careful survey was not undertaken; but the second visit was never made, and this I regret greatly, as the maps published by previous visitors are far from satisfactory.

The summit proper is surrounded by a massive wall of unhewn stone, laid up with some regularity, but apparently without mortar, save in special limited places where the foundations were exceptionally steep. The wall follows the uneven margin of the crest, with many ins and outs and ups and downs, and was evidently intended to make the place impregnable to an enemy. Where the cliffs are precipitous only sufficient masonry is added to make them wholly inaccessible; where the slope is gentle, as on the east side, the wall is zigzagged, showing decided appreciation on the part of the builders of the advantages of the system of salients and re-entering angles. On the gentler slope, where approach was easy and the single wall was not considered sufficient, a second wall was carried across 20 to 40 feet outside of the first and the ends were joined to the main wall at the sides where the precipice begins.

The entrance through the outer wall, shown in the photograph, is near the middle of the outer wall and at the highest point in the profile of the ridge. This has been regarded by all visitors as the original entrance way, but I was led to question this by observing that there is also an opening at the northern termination of the outer embankment. It would seem that this is the natural place for the gateway. An enemy would have to approach by a precipitous slope in full view of the overhanging walls and pass over a raised rock-bound threshold 12 feet wide, between the inner and higher wall and

FIG. 99. GATEWAY OF FORTIFICATION, LOOKING OUT.

a, a, a. Inner wall with heaps of stones intended for use in defense. *b.* Outer wall. *c.* Space between walls. *d.* Gateway. Height of walls from 10 to 16 feet.

a colossal bowlder, 25 or 30 feet in greatest dimensions, with which the outer wall terminates. On entering he would be compelled to pass between the two walls along a depressed space and fully exposed to the missiles of the besieged for several hundred feet, before reaching the inner entrance near the south side. That it was expected or feared that he would thus enter is clearly indicated by the occurrence of piles of roundish stones—mostly of yellowish flinty quartzite, in many cases rounded by pecking and well fitted for use in a sling—at short intervals along the top of the wall. My sketch, Fig. 99, shows these

piles of stones—which are not confined, however, to this part of the fortress—and also gives a correct impression of the bowlder-guarded gateway, looking out. An examination of the opening developed the fact that there are no traces of a connecting wall between the great portal bowlder and the inner wall opposite. The walls at this point are from 6 to 10 feet wide on top, the sides inclining inward a few degrees. The gateways through the outer and inner walls are mere openings, from 6 to 10 feet wide and much broken down at the sides. It is doubtful if they were ever well or systematically faced up and, as I have suggested, it is a reasonable question as to whether the outer opening is really an original gateway or a breach made by recent occupants of the site who use the enclosure as a pasture and outlook. Following the wall along the southern margin of the summit, a second opening is encountered near the west end, through which a steep descent may be made to the fields. Farther on the rocky summit slopes off to the north so that the zigzag wall, following the edge of the precipitous slope, is quite a little below the crest. I am not positive that there is not a third opening through this part of the wall.

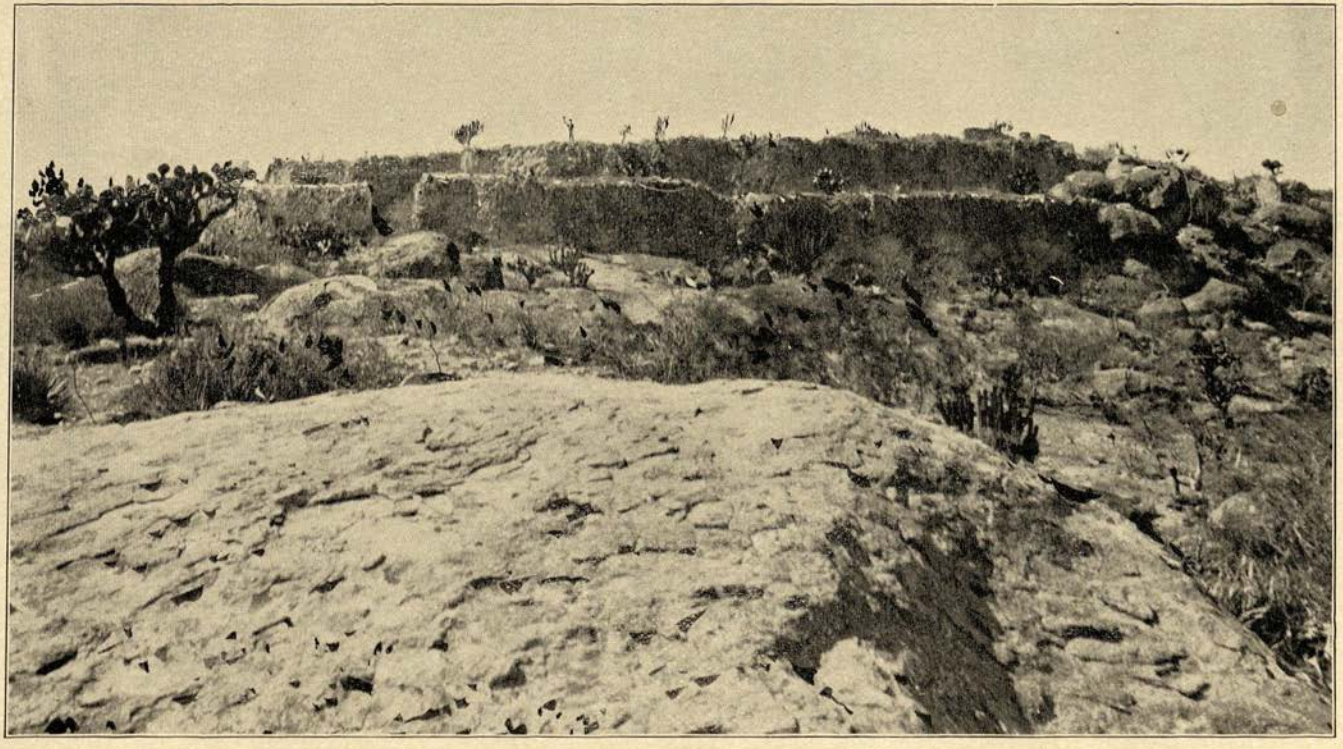
Entering the exterior opening on the Mitlan side, the visitor turns to the left along the outer inclosure, which is much encumbered with bushes and, passing through the inner gateway, ascends a gentle slope to the crest. Here an interesting group of ruins is encountered, the first member of which overlooks the bowlder-guarded gateway and the valleys beyond, and affords a fine panorama of Mitla and the whole upper sweep of the valley. The group of structures consists of three members arranged to form three sides of a quadrangle. The east and south buildings are of adobe, resembling in plan and appearance the adobe ruin of the south-side group in Mitla. The foundations are of adobe, and serve merely to level up the ground and support the superstructure, projecting only slightly beyond the walls. The latter, formed of dark adobe filled with potsherds, are much broken down and do not exceed 8 feet in height at any point. They are 2 or 3 feet thick and show traces of partitions and doorways. The third member of the group is an oblong stone mound which has the appearance of greater antiquity than the other ruins, and probably originally accommodated some sort of superstructure; between this and the north building the sloping ground is leveled up somewhat by a platform faced on the north with stone. The three or four ruins within the inclosure back of this group are much dilapidated and present no new features.

There are everywhere traces of occupation, and the presence of many potsherds and occasional mealing stones indicates permanent

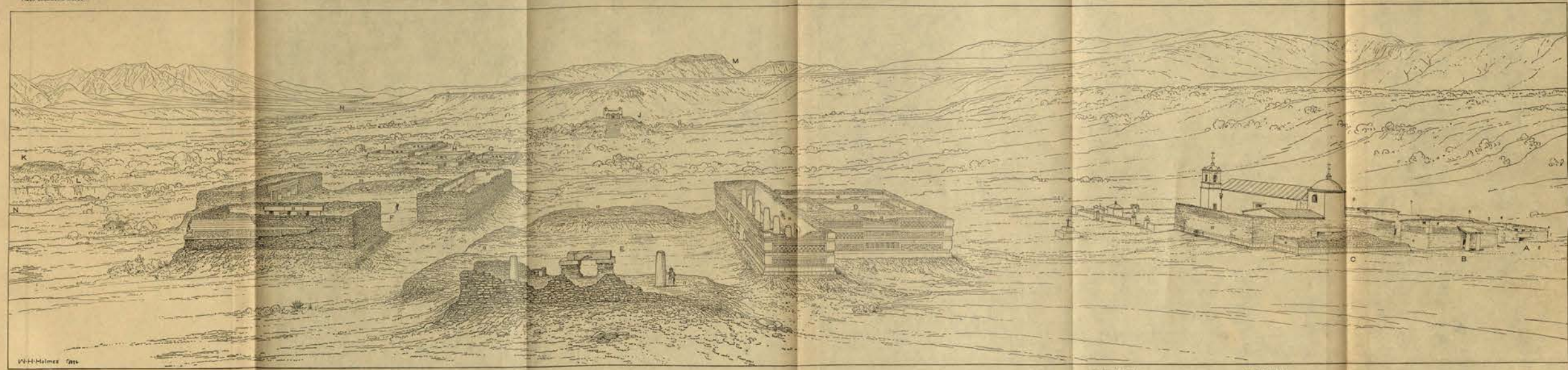
PL. XXXVII. THE FORTIFIED HILL; EASTERN WALLS AS SEEN FROM WITHOUT.

The view shows the approach by way of the rocky but gradual ascent from the Mitlan (east) side. On the north, south and west sides the approaches are very steep. The point of view chosen is the only available one, and is too low to give a good idea of the fortification. The outer wall is in front with the present gateway at the left; the original entrance to the intra-mural space was probably at the right where the wall terminates against some large bowlders. The opening through the inner wall is at the extreme left, so that an enemy entering at the right would have to pass the entire length from right to left (some 300 feet) exposed to attack from the inner and higher wall. A small portion of the east wall of one of the adobe buildings is seen above this wall toward the right.

While Mr. Thompson made the view the writer stood on the inner wall a little to the left of the middle of the picture with hand held aloft, thus affording a means of estimating dimensions.



THE FORTIFIED HILL; EASTERN WALLS AS SEEN FROM WITHOUT.

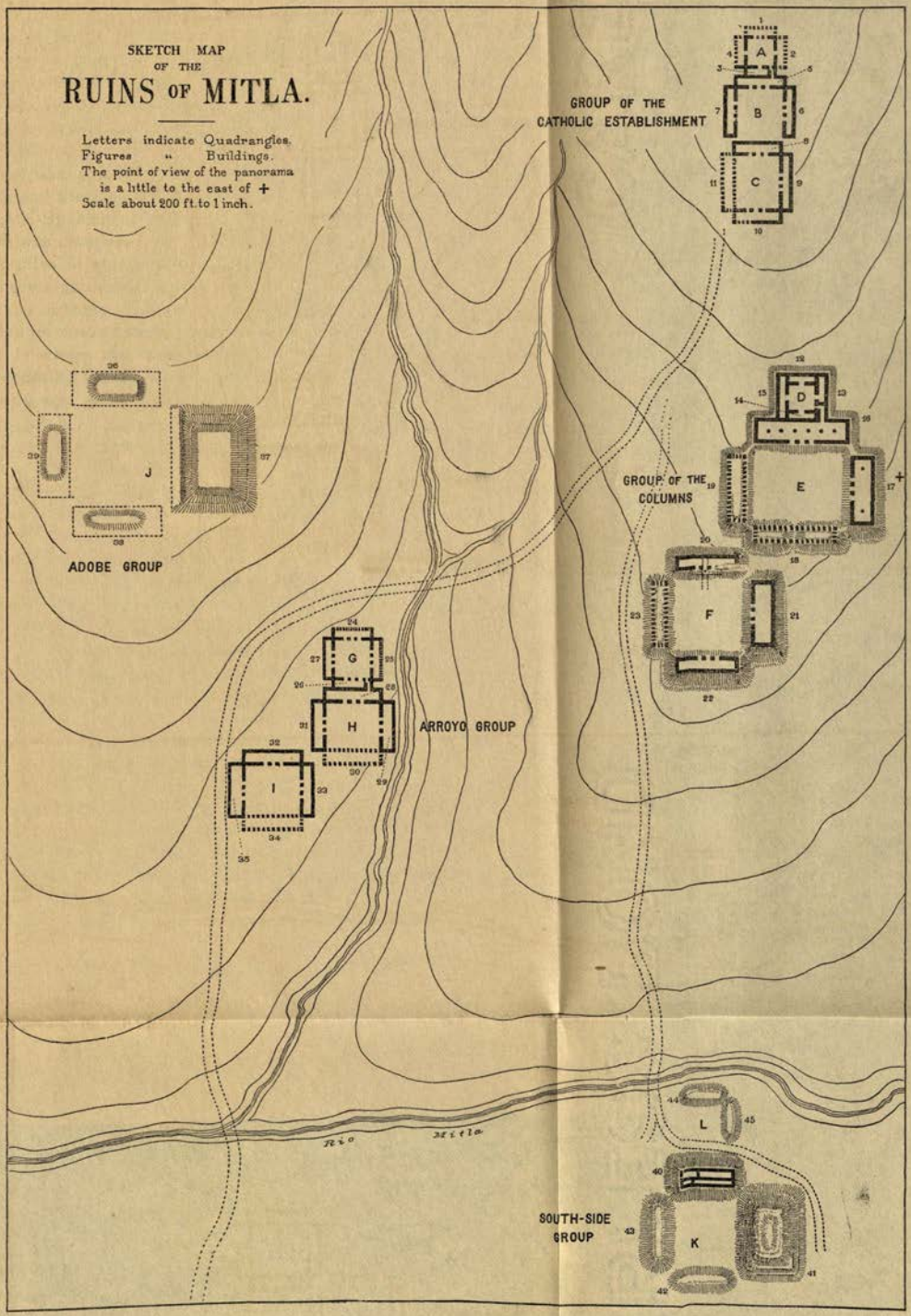


A,B,C. Group of the Catholic Establishment. **D,E,F.** Group of the Colonists. **G,H,I.** Arroyo Group. **J.** Adobe Group. **K,L.** South Side Group. **M.** Fortified Hill. **N,N.** Rio Mitla.

PANORAMIC VIEW OF MITLA.

LOOKING WEST.

PL. XXXVIII. PANORAMIC VIEW OF MITLA.


SKETCH MAP
OF THE
RUINS OF MITLA.
Letters indicate Quadrangles.
Figures " Buildings.
The point of view of the panorama is a little to the east of +
Scale about 200 ft. to 1 inch.
GROUP OF THE CATHOLIC ESTABLISHMENT
A
B
C
ADOBE GROUP
J
GROUP OF THE COLUMNS
D
E
F
ARROYO GROUP
G
H
I
SOUTH-SIDE GROUP
K
L
Rio Mitla

dwelling. Water was probably obtained from a spring at the base of the hill on the Mitlan side. It seems not improbable that burials may be discovered on such parts of the hill adjoining the buildings as contain sufficient soil for the purpose, as a recent visitor, Mr. W. F. Parker, of Omaha, Neb., unearthed some human bones together with various minor relics near the eastern gateway.

It strikes me as not improbable that this fortress is of rather recent construction, as the loosely built walls are remarkably well preserved; and the presence of adobe buildings also suggests a late if not a post-Spanish occupation. That the final desertion of the stronghold was comparatively late is well shown by the fact that the numerous piles of stones intended for defense have not wholly lost their character as conical heaps. It is to be observed further that though many of these stones are artificial in shape they were certainly not rounded for use in defense, but are merely pickings from the neighboring fields where they were originally used, probably as hammers, and where similar forms still occur in great numbers.

QUARRYING AND CUTTING STONE. The discovery of the quarries from which the ancient inhabitants of Mitla obtained their building stone is a matter of much interest to the student of pre-Spanish America. The existence of such quarries is mentioned by several writers, but little information is given save that they are located somewhere along the bluffs and mountain sides near the city. Having devoted much time to the study of quarry phenomena in the United States where the primitive tribes quarried and worked flint, soapstone and mica, and mined copper, I was especially desirous of learning something of this class of work as carried on by nations representing the most advanced culture of the Western Continent. I hoped that some important light might be thrown upon the question of the methods employed in working stone by these peoples. Was the work done by the aid of stone tools and were the half civilized nations yet wholly within the shadow of the stone age, or had they processes and mechanical appliances wholly unknown to us and to the historical peoples with whom we are more fully acquainted?

I was fortunate in securing much evidence upon this point and have reached the conclusion that there is no specific distinction between the work done at Mitla and that of the soapstone workers in Virginia, Pennsylvania and Connecticut; that stone tools were extensively if not exclusively used, and that the picks, axes, sledges and hammer-stones employed were of forms familiar to most of our aborigines.

The stone used by these builders for facing their walls within and without, for the great lintels and door jambs, for pillars, stairways, columns and ceiling stones, is a variety of volcanic lava known as trachyte. It is a massive light gray rock of moderate density and hardness but reasonably tough and durable and easily split and hewn. It is the main constituent of the mountain masses that surround and overlook Mitla, and outcrops in the bluffs and higher cliffs on all hands. Where the compact lava flows overlie rocks of less durability they are undermined at the margins and break down of their own weight, leaving the fresh surface exposed and in many places visible from the valley. The huge detached masses, more or less rounded by weathering, lie along the precipice base and scattered down the slopes.

The builders of Mitla sought and used not only these convenient masses, but went much farther and attacked the solid rock in place, cutting it out in large bodies which were transported long distances over rough country. For ordinary purposes of building the smaller masses of stone could be obtained near at hand, and great quantities were used for pyramids and terraces and for the hearting of massive walls; but to secure bodies for cutting and carving they did not hesitate at great undertakings. Leaving the multitude of rough masses that lay near at hand, as, for example, at the base of the fortified hill a mile away, they followed the lower outcrop several miles to the east, and even climbed the mountain ridge at the north in search of stone exactly suited to their rude but effective chisels.

The nearest evidence of work so far as observed is at the base of the lower bluff on the north side of the valley two miles east of the ruins. From this point transportation was comparatively easy as the way was down gentle slopes cut only by occasional arroyos and smaller gullies which could be passed without great difficulty. But the main quarries are found on the upper slopes of the range to the north nearly a thousand feet above the city and five or six miles away. The feats of engineering necessary to transport masses of stone many tons in weight down a thousand feet of precipitous mountain face, accomplished by these stone age quarrymen, would be regarded as important undertakings even by our enterprising engineers of to-day. Their means and appliances were no doubt extremely simple, and much time must have been consumed in the work. In view of the vast results accomplished I believe we are warranted in assuming the employment of large numbers of men directed by a despotic power—a power not limited by the life of an individual but continued without break from generation to generation.

We have not secured any direct evidence of the means of transportation, though this may be done in time; and it is possible that even the routes over which the great stones were carried may yet be traced upon the mountain sides.

For the present I must content myself with the evidences of quarrying and cutting stone, which are sufficiently remarkable and so well defined that speculation need not enter into the presentation of the case. Mr. E. H. Thompson, who was my companion and co-laborer throughout the trip, visited the high mountain quarries known to the present natives of Mitla, while I skirted the lower bluffs seeking traces of the workings that it seemed, from the character of the cliffs, should exist there. Taking a guide and horses he

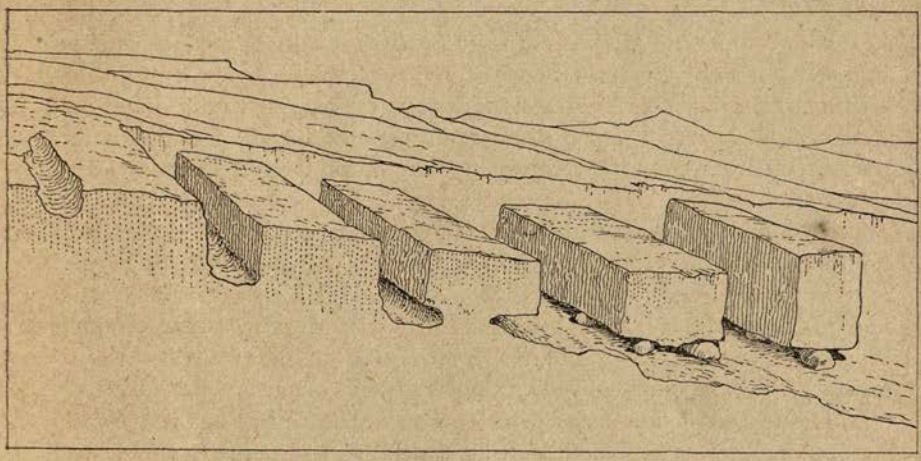


FIG. 100. METHOD OF CUTTING OUT BLOCKS OF TRACHYTE IN THE QUARRY. DRAWN FROM DESCRIPTION OF MR. THOMPSON.

climbed the mountain to the north, and just before reaching the summit, nearly a thousand feet above the village and at least six miles away, encountered the quarry. About it were several large blocks, already removed from their beds, while others had been left partly cut out or only outlined. The work had been undertaken on the sloping surface of a solid mass of the trachyte. Channels had been cut the full length of the blocks desired and to the proper depth, and likewise across the ends; when these were widened sufficiently, undercutting was begun and carried on until the mass was severed and could be broken off by the aid of levers or wedges of wood, possibly aided by water. After the removal of one block the amount of cutting for each stone was reduced somewhat, as one side only, instead of two, had to be channeled. The channels observed were a foot or more wide and

the depth was about three feet in the deepest. Figure 100 will sufficiently indicate the nature of the work, though in a very formal way. The stone at the right has been removed and set upon edge; the next one is free and blocked up on small stones; the third is well undercut and the fourth is channeled nearly to the full depth.

The larger blocks among the half dozen wholly removed and set on edge are 12 feet or more in length by 5 or 6 wide, and from 2½ to 3 feet thick. Such a stone would weigh perhaps fifteen tons. The intention of the quarrymen was possibly not to carry these blocks directly down the mountain but to take some roundabout way that would give reasonably gentle slopes.

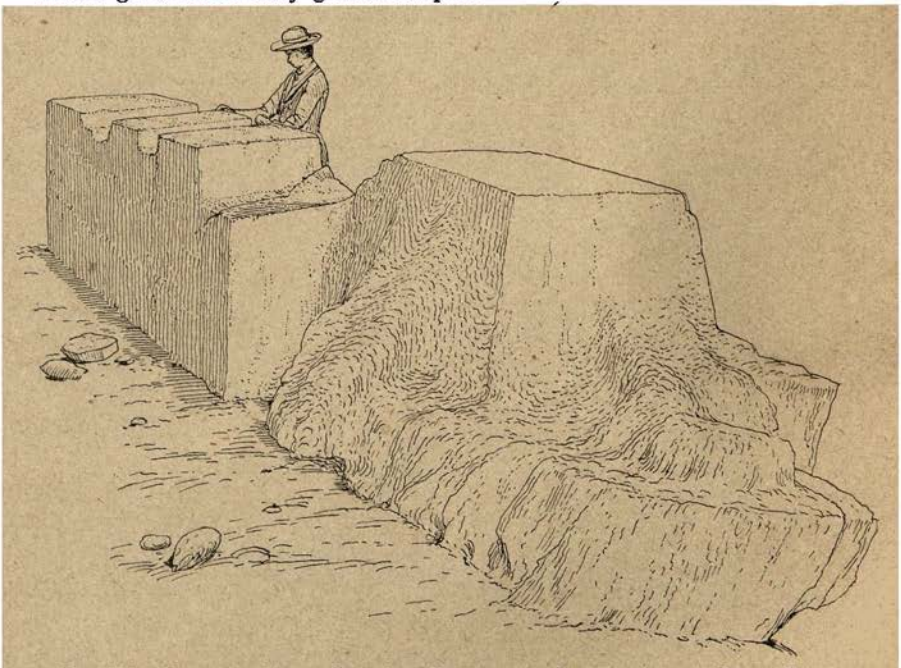


FIG. 101. PARTIALLY HEWN BLOCK OF TRACHYTE AT BASE OF LOWER BLUFF TWO MILES EAST OF MITLA.

My own observations along the lower bluff were of equal interest and furnished important evidence as to the work of cutting and dressing the stone. The most striking illustration is that furnished by a partially hewn block lying at the base of a massive overhanging wall two miles east of the ruins. Originally the mass was about 25 feet long and probably averaged 5 or 6 feet wide and as much in height, though far from regular in shape. The work of shaping this stone and dividing it into parts was well under way when operations ceased.

The pick marks are everywhere distinctly seen and the heavy stone picks lie all around the massive block with their bruised points and flaked margins almost as fresh looking as if sharpened and used but a year ago. The remarkable outline to which the block had been reduced when the work ceased is best shown by the sketches presented in Figs. 101 and 102.

The top and portions of the sides had been reduced to approximate shape, but it was evidently intended to cut the mass up into a number of pieces. This may have been the original intention, or may have resulted from the appearance of a flaw which crosses obliquely nearly through the center of the stone. At any rate, the cutting of the sides and top indicates that it was planned in the first place to separate the mass into at least two blocks, as the faces of the larger end are not on a line with those of the smaller end.

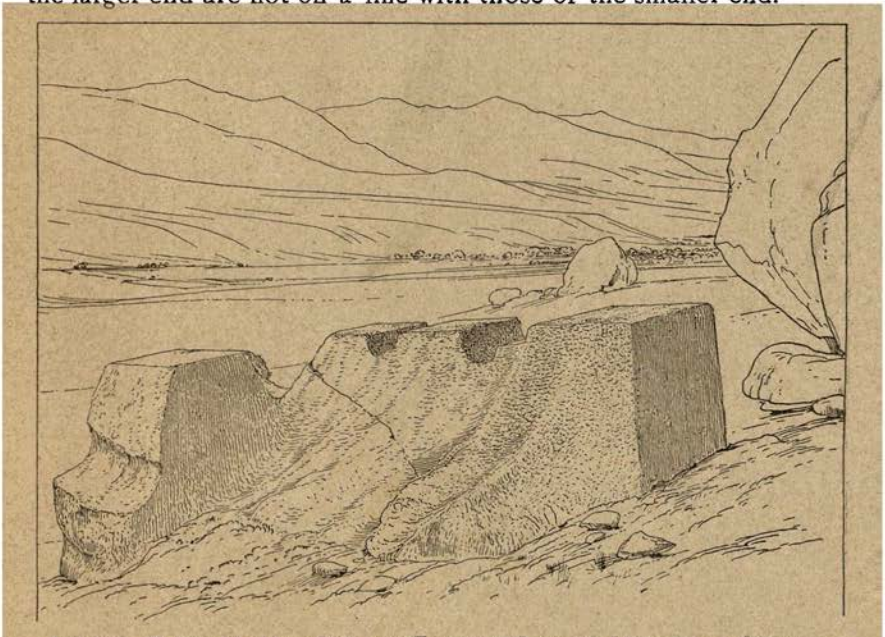


FIG. 102. PARTIALLY HEWN BLOCK OF TRACHYTE SHOWING PROGRESS OF CUTTING.

The method pursued in dressing the stone is readily observed. The upper surface was first leveled off and the size of the block or blocks determined upon; then the work of hewing the sides and ends began. The top was outlined all around and the vertical cutting followed. As seen in Fig. 101 the farther end is squared down to the ground, but the larger mass at the front is not yet half cut away, large projections below remaining to be removed. On the other side the work is even less advanced, as shown in Fig. 102.

All over these surfaces are seen the evidences of tedious labor; here a workman had pecked away until a broad shallow channel, deepened to the proper plane, was carried down toward the base. Next this is another area of cutting, and beyond another and still another, as if many workmen had labored side by side, leaving low ridges between the area covered by each. Though lying here open to the weather for more than four hundred years, the pick marks are clearly visible, and even the direction of the stroke and the width and nature of the blunt point of the pick are strongly suggested.

Difficult as was the dressing of the top and sides, the cutting of vertical channels for dividing the blocks, and the undercutting required to remove irregularities of the base, must have been much more formidable. The cross channels, as indicated in the drawing, are wide and somewhat irregular, and had not reached much more than a foot in depth in any case when the work ceased. The work as a whole presents close analogies with that done in the soapstone mines of the United States, where channeling and undercutting, though on a smaller scale, were constantly resorted to.

Turning from this most interesting and instructive illustration of the nature of the work done by the ancient stone cutters, I sought traces of the tools employed and was repaid by numerous finds. Scattered all around were battered, pick-shaped stones, irregular sledge-like masses and rounded or discoidal hammer-stones. These

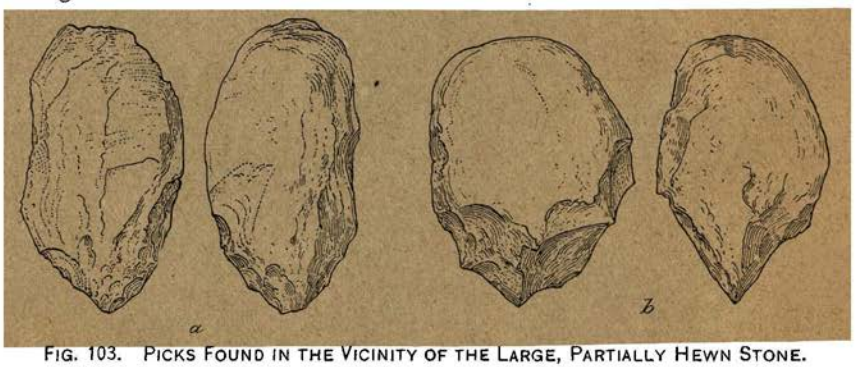
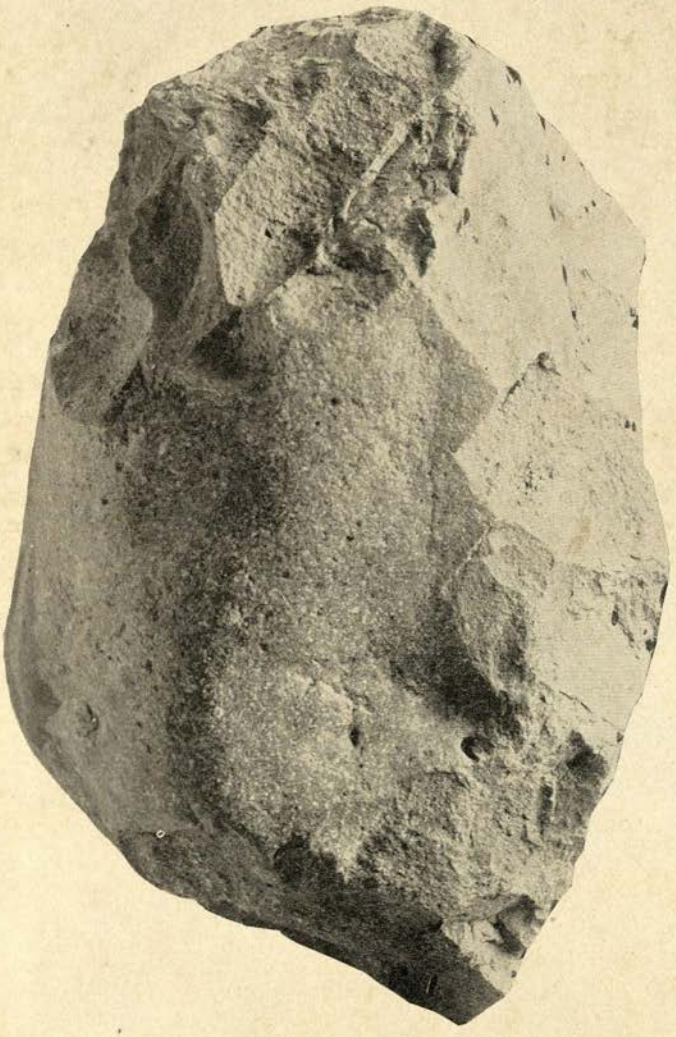


FIG. 103. PICKS FOUND IN THE VICINITY OF THE LARGE, PARTIALLY HEWN STONE.

tools were undoubtedly used in the stone cutting operations, as apparently no other work had been carried on in the vicinity. They were made of roundish masses or of water-worn bowlders of the harder varieties of volcanic lava brought from the valley below or from some more distant locality. In appearance these implements were exactly like the rude picks found in our northern quarries and on village sites in many parts of the country. Typical specimens are shown in

PL. XL. STONE PICK FROM A MITLAN QUARRY.

This is a typical example of the large, rude picks found in considerable numbers in the quarry, two miles east of Mitla. It was sharpened by fracture, and was doubtless hafted when in use. One-half actual size.



STONE PICK USED IN QUARRYING STONE. (ONE-HALF ACTUAL SIZE.)

PL. XLI. HAMMER-STONE AND CELT FOUND IN A MITLAN QUARRY.

The large hammer-stone shown in *a* is made of trachyte by flaking, and is battered around the periphery indicating much use. It is identical in appearance with the flint-quarry hammer-stones of the United States. One-half actual size.

The celt or hatchet shown in *b* was found near the hewn stone in the quarry and may have been used in the work of shaping it. One-half actual size.

a

b

a. Cylindrical Stone with Bas-Reliefs.
b. Annular Stone with Bas-Reliefs.

outline in Fig. 103, and an average example, which I carried home, is presented in Pl. XL. As a matter of course all of these implements were hafted when in use.

A hammer-stone is given in Pl. XLI–*a*. I was so fortunate as to find on the slope, a few yards below the partially hewn block, a short, heavy, polished celt or adz of dark looking dioritic rock, Pl. XLI–*b*, which may have been used in the work, but the presence of so many of the ruder specimens makes it probable that they almost exclusively were used—at least in roughing out the blocks. Polished axes may have been employed in final stages of the cutting. Copper celts are found in Mitla, as in other places in Mexico and Yucatan, but it does not appear that they could have served any purpose in stone cutting, as the metal is too soft for effective execution. These celt forms were probably hafted, as are the modern iron celt-axes of Mitla, by being set in a socket in a hardwood handle.

FLAKED STONE IMPLEMENTS. It is an interesting circumstance that Mitla, whose architectural remains represent the most advanced neolithic culture, should furnish also plentiful traces of the practice of the simpler phases of art in stone. Flaked stones are found on all hands, and represent at least three distinct classes, (1) the picks and hammer-stones employed in the quarries for cutting out and rough dressing the great stones used in the buildings, (2) a very numerous class of flaked stones—cores, flakes and hammer-stones—found in and about the ruins, (3) the rejectage of flint blade making found on a shop site some distance west of the ruins.

The quarry implements have already been described and belong, without doubt, to the latest period of pre-Columbian occupation. Implements of the second group probably also belong to this period of building and are illustrated in Pls. XLII, XLIII and XLIV. They are distributed through the surface soil of Mitla and are found in great numbers in the cultivated fields bordering the stream above and below the village. They are generally formed of a coarse, yellowish, striped flint or flinty quartzite, and include (1) core-like forms from which the flakes have been struck, (2) the flakes struck off, and (3) the globular hammer-stones used in flaking and probably also in other shaping operations. The most remarkable fact relating to these flints is that they are found—especially the cores and flakes—in great numbers in the adobe mortar used in hearting the walls and pyramids of the great buildings of Mitla. It is not unusual to find the cores in nests of two, three or more, and a dozen may be seen in the crumbling wall of the Quadrangle of the Basement Galleries from a single point of view. The flakes and small fragments are much more

numerous, but do not, on account of their small size and lack of specialized shape, attract so much attention.

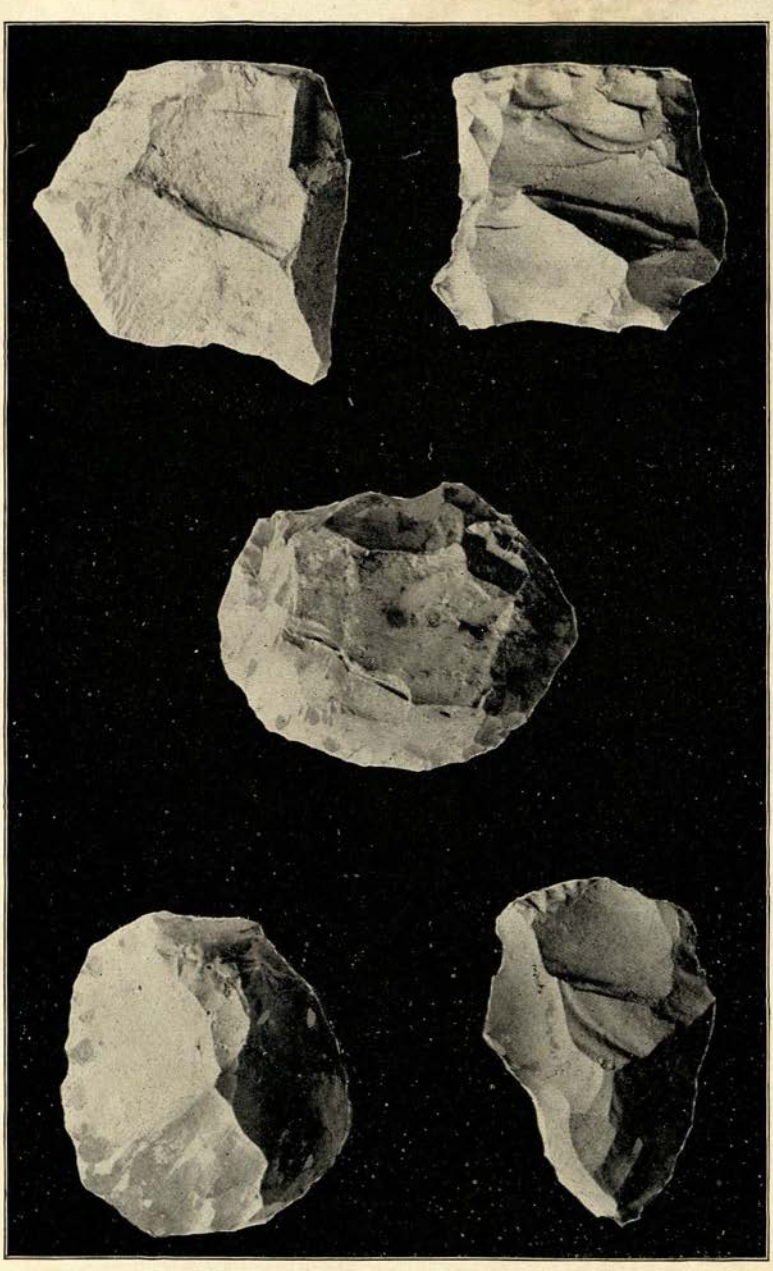
Certain questions arise with respect to the occurrence of these flints. First, are they in the soil as a result of operations carried on at some earlier period, making their association with the building purely adventitious? Second, were they or any of them made to be used in connection with cutting or dressing the stone for the buildings, thus, when discarded, becoming intermingled with the soil and with the adobe? Third, were the flints gathered and flaked to be added to the adobe for the purpose of increasing its durability? As yet I am not able to give satisfactory answers to these questions.

The stone used undoubtedly occurs in the neighborhood and in bodies sufficient to be quarried, or in surface masses so numerous as to be collected in considerable quantities. Its flaking qualities are not superior. The most striking of the shaped forms is the core or nucleus, examples of which are seen in Pl. XLII. They almost exactly duplicate the cores found in flint quarries of the United States, and are from 1 to 4 inches in diameter at the upper end, and generally somewhat conical below. In typical specimens the crown is circular and flat, and the sides are fluted as a result of the removal of successive flakes. In the plate the cores are shown in an inverted position.

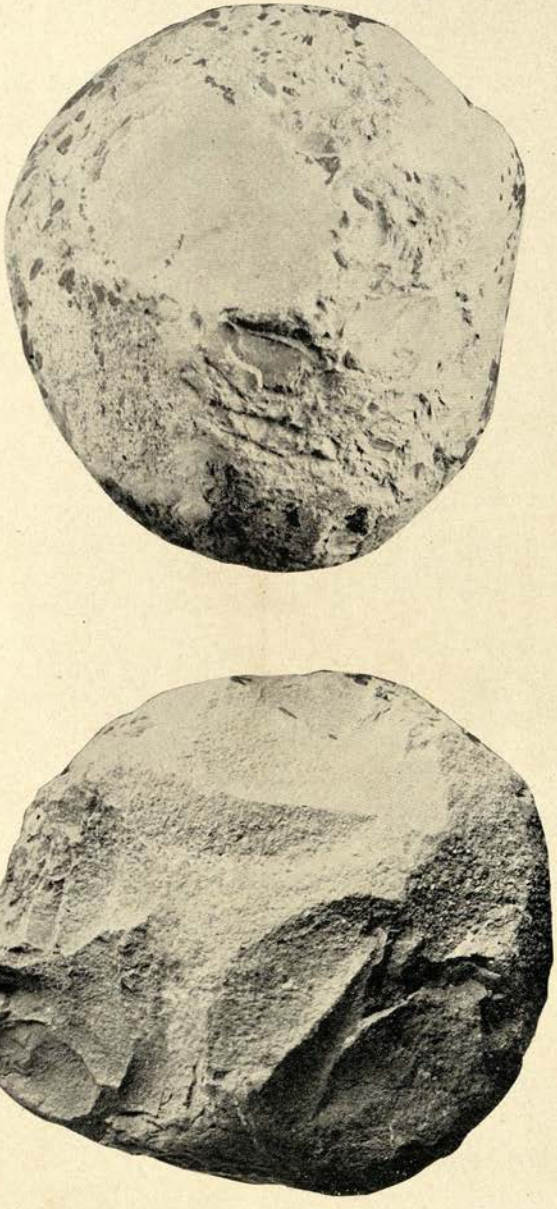
The flakes associated with the cores or nuclei in the soil and in the adobe of the buildings are illustrated in Pl. XLIII. They show the usual features of nuclei-derived flakes—the faceted exterior, the conchoidal or flat back, the sharp lateral edges and the more or less acute point. One question that arises with respect to these objects is as to whether the cores alone were designed to be used or the flakes alone, or both. Examination of hundreds of the flakes indicates that few have been used, though rare specimens are chipped to a beveled edge at one side, as if for use as scrapers or chisels. The site furnishes no other implements, such as arrow-points, that could have been made from such flakes.

The most natural theory with respect to these flints is that since they are found so plentifully about the ancient building they were employed in the work of cutting stone. Possibly the flakes, set in handles, were used in the manner of the modern bush hammer. Possibly the cores were to be used in a similar manner. In support of the latter idea I may mention the fact that many of the cores show battered edges as if used in cutting or pecking operations; and it is also true that very many have been so much battered that the core form is lost, and they have become fully developed discoidal or

FLINT CORES, FROM WHICH FLAKES HAVE BEEN STRUCK OFF. (THREE-FOURTHS ACTUAL SIZE.)



FLINT FLAKES AND SCRAPERS FROM MITLA. (THREE-FOURTHS ACTUAL SIZE.)



HAMMER-STONES FROM MITLA. (THREE-FOURTHS ACTUAL SIZE.)

globular hammer-stones. Typically developed hammer-stones are shown in Pl. XLIV. The fact that, with the exception of these objects, there are no implements in sight that could have been employed in the extensive work of dressing the stone employed in building tends to support the idea that they were really the sculpturing tools of the ancient builders.

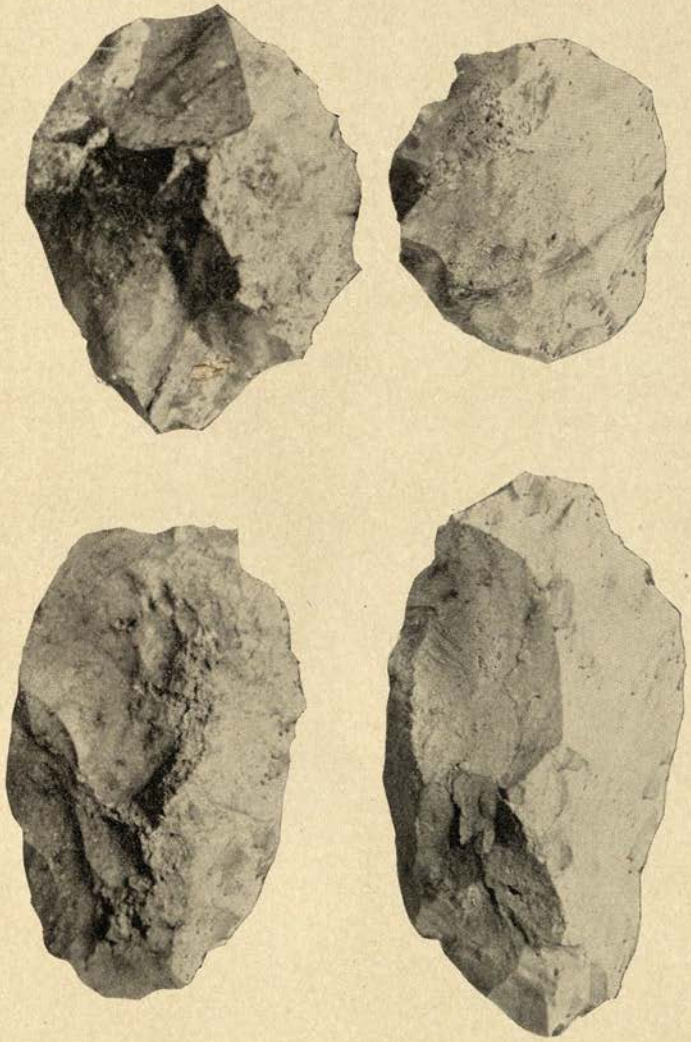
Flaked stones of the third variety do not occur in Mitla, but are found at the base of the fortified hill, a mile to the west. Descending from the hill by the long eastern spur, I came upon an excellent spring of water at the base, and about it encountered traces of flint flaking. The gentle slope east of the spring had recently been scratched with the plow, and the ground was filled with broken flint, generally of a grayish hue, and wholly distinct from the yellowish flinty rock worked elsewhere. Shop refuse occurred over the space of an acre or more, and the rejectage duplicated in every way that of the flint shops of the United States. I found but one hammer-stone, and that was imperfect; but there were many of the abortive, leaf-shape blades intermingled with the flakes and fragments, and specimens are shown in Pl. XLV. There was evidence of no other work than that of blade making, and it seems not improbable that this site was occupied by a people distinct from the builders of Mitla, or possibly by the Mitlan stock at an earlier period of its history. The slopes of the valley everywhere furnish bits of bright colored flint, and traces of working are encountered at every step, yet very few flaked implements are found, and I did not see a single well shaped arrow-point while in the valley of the Rio Mitla. Finely made flaked blades and specialized points are occasionally found, however, in the Oaxacan region.

COPPER IMPLEMENTS. Among the most characteristic of the Mitlan art remains are certain hatchet or tau-shaped objects of hammered copper found in very considerable numbers in graves, and possibly also in hoards or caches. Measured with the stem they vary from 4 to 7 inches in length, and the width across the blade is about the same. As the blades do not exceed one-tenth of an inch in thickness in any part, it is apparent that they could not have been employed as hatchets or chisels, although set in handles they would perhaps have served a good purpose as trowels, knives or scrapers. The generally accepted theory of their use is that they were the money of the ancients, or at least served as a standard of value. It may be remarked that the shape and tenuity suggest the possibility of their use as ornaments, and it appears that if well polished and set as a crowning feature in a helmet or head-dress, they would prove

very effective. Possibly, however, they were symbols and served some religious purpose.

The only other objects of copper that have come to my notice are a few celts or chisels of ordinary shape and size.

POTTERY. The ceramic art of the Oaxacan province presents many unique features and bears evidence of boldness and freedom in the manipulation of clay. There are vessels of almost every variety and form, but the genius of the potter was expended on a class of figurine vases often of large size and remarkable elaboration. The vessel—which always remained as a foundation or nucleus for the piece, though much subordinated—was faced or nearly covered with strange human figures decked in gaudy attire and loaded with extraordinary symbols. This ware was sometimes painted, but usually it is in the plain gray color of the baked clay; numerous fragments are found on most of the ancient sites, and our museums contain many handsome and perfectly preserved pieces. As I have in hand a special work on the Ceramic Art of Mexico, I shall not enter into a discussion of the subject in this place.



FLINT REJECTAGE OF BLADE MAKING FROM A SHOP NEAR MITLA.
ONE-HALF ACTUAL SIZE.

RUINS OF THE VALLEY OF MEXICO.

SAN JUAN TEOTIHUACAN.

RANK OF THE CITY. My two brief visits to the ancient city called San Juan Teotihuacan do not warrant an attempt at monographic treatment, but I may profitably present a panoramic view with brief descriptions, and a few paragraphs recording my impressions of this group of ruins. In the magnitude of its remains and in the evidence the site furnishes of population and antiquity, Teotihuacan stands easily at the head of the ancient cities of Mexico. It lacks the well-preserved, sculpture-decorated buildings found elsewhere in Mexico and Central America, but this is doubtless due to the rarity of suitable building stone in this part of the valley. The famous structures of Mitla, Palenque, Uxmal and Chichen-Itza, had they been built of such materials as are here available, would to-day be mere rounded heaps of debris. In dimensions, these cities in no way compare with the colossal piles of the chief city of the plateau. The bulk of the great cluster of pyramids, terraces and mounds is far in excess of that of any other group of remains. Cholula has a greater pyramid but lacks the multiplicity of attendant structures which at San Juan cover square miles of ground. If the entire mass of the ruined structures of either Chichen, Uxmal or Mitla was to be heaped up in a single mound, it would hardly surpass the great Pyramid of the Sun alone in bulk, and the whole bulk of the Teotihuacan remains is many times that of its chief pyramid.

HISTORY AND PEOPLE. Of the history of this great center of population and culture, we have hardly a trace save that furnished by the remains themselves. The building of the city has generally been attributed to the "Toltecs," but we cannot safely say more than that the builders were probably one of the numerous Nahuatl nations that for many centuries dominated the valley of Mexico. Though the name of the nation is not known, it is clear that the people, whatsoever their period or affinities, were intelligent, enterprising and powerful, and that their sway extended over a long period of years. The art remains indicate a culture differing decidedly from that of Tenochtitlan—the Aztec capital, now the capital city of Mexico—differing from

it in so many ways as to warrant the inference of a distinct nation; but at the same time the analogies are so close and numerous that the two peoples, if not of the same stock, must have been closely associated for a great number of years.

The nature and arrangement of the principal structures and features of the city would indicate the dominance of religious motives in their construction, and this, coupled with the well-known fact that ceremonial life among the native peoples in general was of vast importance, warrants the conclusion that Teotihuacan was in a sense a religious center; but it does not follow that any part of it may not have been devoted to secular uses, and it seems certain that, aside from the great central features, the city was largely one of residence, for there are here more decided and extensive traces of domestic architecture than in any other of the great cities of the country. It is noted that among all the monuments and relics of art there is a singular absence of indications of a warlike spirit, and, though it is next to impossible to think of a great American nation not built up and kept together on a military basis, the position of the place may have been so commanding as to raise it for a time above the level of ordinary strifes. It is probable that agriculture was the chief resource of the people, though many other arts and industries flourished.

LOCATION AND PLAN. The ruins are located 25 miles northeast of the City of Mexico, and occupy a gently sloping site in the midst of a broad fertile valley opening out to the southwest into the great basin of Lake Texcoco and to the northeast into the higher level plateaux. On the north the hills are near at hand, while on the south, as seen in the panorama, the cone-capped ridges are much farther off extending in a long line toward the southwest. In the laying out of Teotihuacan there is more evidence of foresight and system than in most of the ancient cities. Though the orientation is not accurate—the main features of the plan showing an error of about 15 degrees—the important features are arranged in more or less complete harmony and regularity about a great artery-like thoroughfare called the "Camino de los Muertos"—the "Pathway of the Dead."

In matters of assemblage the analogies are closer with Monte Alban than with the other cities, though the contracted nature of the site of the latter did not permit the freedom of arrangement possible in San Juan. The greater courts, pyramids and groups of structures are surrounded by numerous inferior pyramids more or less symmetrical in placement, and throughout the wilderness of remains the quadrangular idea can be frequently recognized.

SUBSTRUCTURES. The two great pyramids stand in a class by themselves, entirely overshadowing the multitude of piles that cover the plain. These pyramids, as well as all other pyramidal masses, were probably substructures for buildings. All were truncated and ascended by stairways, and the sides of the loftier were generally terraced. In appearance nearly all resemble mere heaps of debris, for the superstructures have crumbled and buried the foundation masses, and these latter are much broken down about the summits, and often rendered unsymmetrical by modern excavation and the inroads of the plow and hoe; yet in very many cases the original rectangular outlines and flat tops are traceable, and in the panorama these features have been somewhat strengthened, thus expressing what is known through a close examination rather than what is seen from a distance through a veil of foliage and debris.

SUPERSTRUCTURES. All the loftier structures and those occupying elevated sites have entirely disappeared, as their exposed position has rendered them a quick prey to the agencies of destruction. But many lower level buildings, especially domiciliary structures, must

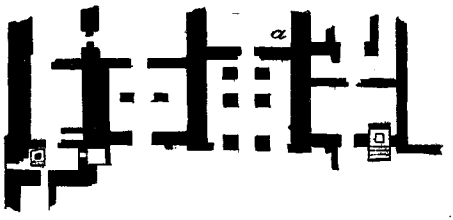


FIG. 104. PORTION OF GROUND-PLAN OF BUILDING UNCOVERED BY CHARNAY.

still be preserved beneath the debris, and the discoveries of Charnay and Batres, which have thrown light on many obscure points must in time be supplemented by other even more important revelations. The ground plan of the building disclosed by Charnay is highly complicated (Fig. 104), and shows a degree of specialization of apartments, passageways and courts entirely unknown in the southern and eastern cities.

All classes of structures were built of irregular masses and fragments of lava—gathered largely, no doubt, from the neighboring slopes and hills—and of adobe—the earth of the plains more or less intermingled with comminuted volcanic materials—obtained from the vicinity of the building sites. Construction was massive and strong, the adobe acting as a cement, but when the walls were neglected and

exposed to the elements disintegration was comparatively rapid. The exterior surfaces of the walls were carried up—in some cases at least—with a slight inward incline. It happens that none of the walls, so far uncovered, are preserved to their full height.

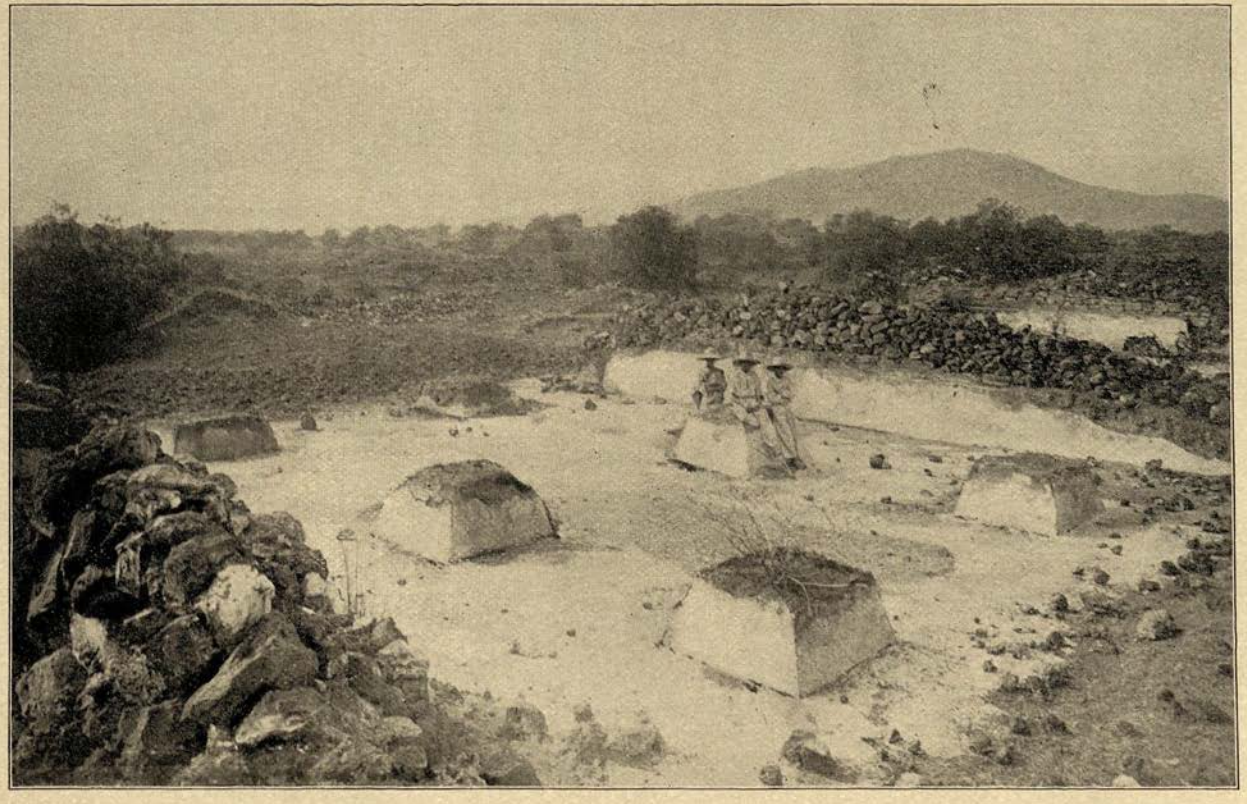
Facings of important surfaces were sometimes of selected stone. Hewn stone was little used, and the laying of regular courses in mortar was not common. All surfaces were evened up with mortar and finished in color; and some were decorated with mythologic as well as formal designs.

Details of construction are not well made out; doors were rectangular and comparatively plain; but no windows have been observed. It is believed that the roofs were flat and formed of wooden beams covered with thick layers of cement. Historic records show that this was true of the neighboring city of Texcoco, though drawings in the various codices indicate a preponderance of sloping roofs throughout Mexico. Where extended chamber space was required masonry pillars were built to support the beams. These pillars, as exposed by Charnay's excavations, were square and had inclined faces. Temple architecture must have presented many unique, handsome and possibly imposing features, and the indications are that dwellings—probably largely communal—were of a somewhat pretentious character.

Among my photographs I find one, made by W. H. Jackson during our visit to San Juan in 1883, which represents the structure uncovered by Charnay in 1880. As this view seems to give a much more satisfactory idea of the remains than anything published by the explorer in his handsome work, it is perhaps advisable to reproduce it here (Pl. XLVI). In it we are looking toward the southeast across the great six-column chamber or hall from the point marked *a*, Fig. 104. The Pathway of the Dead passes to the left of the excavation, and is indicated by a line of dark trees. Beyond the Arroyo of the Rio San Juan—which is near at hand, though entirely hidden by foliage—and a little to the right of the middle of the picture, a glimpse is obtained of the pyramid which stands within the inclosure of the Citadel; and dimly shadowed forth in the far distance is the mountain mass seen to better advantage in the panorama. The floor of the house was evidently finished in white cement or plaster, and the six sloping pillar bases and the walls are likewise plastered. Charnay was unable to determine the nature of the upper part of the columns, but the walls are sufficiently well preserved to show that they, at least, were carried up perpendicularly to their full height. The columns were also probably continued in masonry, although timbers may have been used.

Pl. XLVI. Foundations Exposed by Charnay's Excavations at Teotihuacan.

In the view we are looking to the southwest across the ruin of the large hall in which are the bases of six masonry columns supposed to have served in supporting the roof. The Pathway of the Dead passes obliquely across the picture just beyond the farther pair of column bases. Photograph by W. H. Jackson.



FOUNDATIONS EXPOSED BY CHARNAY'S EXCAVATIONS AT TEOTIHUACAN.

SCULPTURE. It is a remarkable fact that few elaborate sculptures have been found at Teotihuacan. The best known specimens are the two large idols in human form shown in Figs. 105 and 106. They are crude—even archaic—in their treatment. The serpent was a prominent subject here as elsewhere in Mexico, as indicated by several sculptures published by Charnay. Although many minor pieces exhibiting skill in carving have been found, there appears to be nothing to compare with the elaborate, highly finished and tasteful work of the great Aztec and Texcocan districts about the lakes. Stone implements are very numerous, and include hammer-stones, pestles, ribbed fiber beaters, obsidian knives, etc.

POTTERY. The potter's art was extensively practiced, and the site furnishes a greater variety of wares than any other in America. It is evident that a long period of occupation is represented. Vessels were of varied form, and range in treatment from the lowest limits of simplicity to the most elaborate phases of the native art. In the banks of the great Arroyo of the Rio San Juan I found fragments of vases corresponding in color and design with the remarkable butterfly vase preserved in the Museo Nacional—a piece of work rarely surpassed in America. The decoration of this vase is identical in general style with that of the owl fresco discovered and illustrated by Batres.* Dark, plain wares are plentiful, and resemble those of Texcoco, and the simple red wares of the Aztecs are found scattered about over the surface in many places. As a whole the San Juan wares are easily distinguished from those of Tenochtitlan. Two classes of objects are peculiar to this site—the little clay heads found in astounding numbers and variety, and the small cup-like objects suggesting candlesticks, the use of which is not finally settled.

The old Indian potter, who has supplied the museums of the world with imitation antiquities, is still at work in his little shop near the railway station in San Juan.

PAINTING. The paintings observed in the pottery and on the walls of houses recently uncovered are similar in style to examples observed elsewhere in Mexico, and are of the same general character and grade as those found in the various manuscripts preserved in the museums of Europe.

LITERATURE AND EXPLORATION. I will not attempt to review the literature of San Juan Teotihuacan or even to cull from it, for it is very voluminous and at the same time largely superficial and speculative. The Maximillian Commission, Charnay and Batres, have made beginnings in the grand work of systematic excavation—which alone

* Batres, Leopoldo: Teotihuacan. Mexico, 1889.

will disclose the limited range of facts still available to the historian. My remaining notes shall be devoted exclusively to giving an idea of the appearance of the ruins as a whole. The relations of the greater features to each other and to the natural features of the locality are seen to good advantage in the panorama.

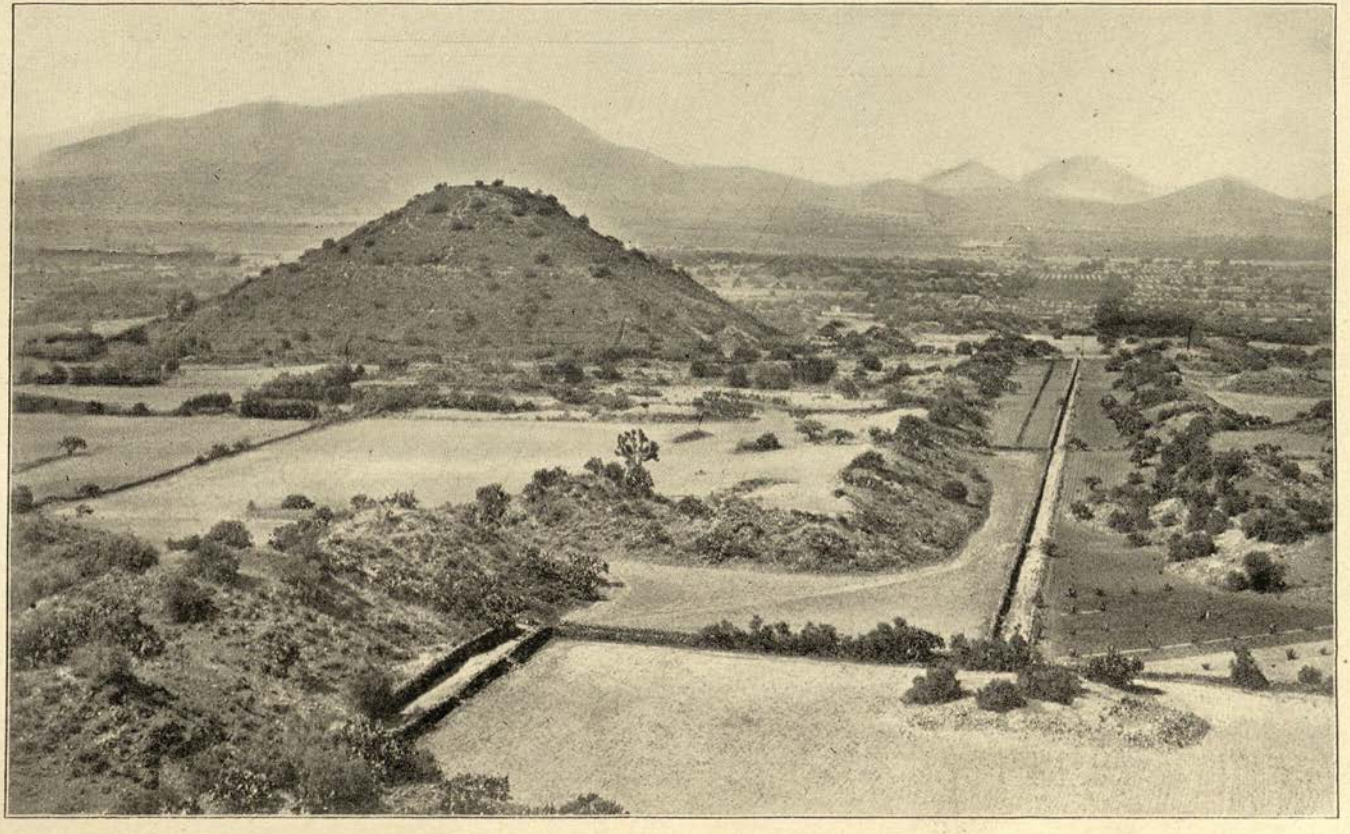
PANORAMIC VIEW. The sketch for the view presented in Pl. XLIX was made from the summit of the Pyramid of the Moon and for the most part during the progress of a wind and rain storm, and is not accurate in all details. In making final drawing a point of view a little to the west of the summit of the Pyramid of the Moon was assumed. The latter monument is thus made to appear in its proper relation to its associates. It is unfortunate that the summit of the structure obscures to some extent its terraced south face and the mound lying near its southeastern corner; but all the great features of the site, five in number, are clearly brought out in the view. The Pyramid, of the Moon occupies the immediate foreground, A. At the left, rising grandly above its cluster of terraces and attendant pyramids, is the Pyramid of the Sun, B. The pyramid-bordered Court of the Battered Goddess, C, appears behind the Pyramid of the Moon; and leading out of this and extending far away toward the south is the Pathway of the Dead, D; and beyond the Pyramid of the Sun, on the southern bank of the Arroyo of the Rio San Juan, is the noble group called the Citadel, E. The course of the Rio San Juan, which runs to the west—that is, to the right in the picture—is indicated by the letters F, F, and the Cathedral of the Village of San Juan appears at G.

Desiring that no wrong impression shall be conveyed by the panorama, which was hastily made, I reproduce in Pl. XLVII a photographic view from the summit of the Pyramid of the Moon. The object of the panoramic sketch is to give a map-like clearness and completeness to the view, while the photograph serves to record details of actual appearance. It should be observed, however, that the photographic view does not bring out the minor works to advantage, as they are obscured by culture features and rendered indistinct by defective light and shade, whereas the drawing slightly emphasizes or exaggerates the forms.

PYRAMID OF THE MOON. This imposing pile (A) is seen in the foreground of the panorama, and though now somewhat rounded in contour from crumbling above and accumulation of debris below, the original form was evidently that of a rectangular, truncated pyramid. The base of the mound measures about 450 feet from north to south and 500 feet from east to west; the truncated summit is not far

PL. XLVII. SAN JUAN TEOTIHUACAN FROM THE PYRAMID OF THE MOON.

In the foreground of this view we look down from the Pyramid of the Moon into the Court of the Battered Goddess, and beyond follow the Pathway of the Dead toward the south across the Rio San Juan. The great Pyramid of the Sun is at the left, and behind it in the midst of the plain the village of San Juan is indistinctly seen. Roadways and modern stone fences, separating land holdings, are a prominent feature of the view, while the numerous pyramidal piles bordering the Court and Pathway are unfortunately obscure.



SAN JUAN TEOTIHUACAN FROM THE PYRAMID OF THE MOON.

from 50 by 60 feet. The sides sloped originally at an angle of about 45 degrees, and were interrupted by narrow terraces now barely traceable. Early visitors mention the occurrence of remnants of a stairway on the east side, and indefinite references are made to a building on the summit. Against the base, on the south side, a platform-like projection is seen, now much modified in appearance by recent excavations and by the accumulation of debris from a tunnel carried into the middle of the face of the pyramid. Reports regarding the composition of the mass, derived from these excavations, indicate that the materials were probably obtained from the surrounding plain, mixed as adobe and added in more or less regular layers. The surface was faced in part if not wholly with unhewn or slightly dressed stone and finished presumably in plaster. The summit commands a splendid view of the ruin group, and in the palmy days of the great city the spectacle from this point must have been imposing indeed.

It would seem but natural, reasoning from analogy, that the summit temple faced the south, and that a wide stairway descended from the main portal to the court below.

PYRAMID OF THE SUN. This vast mound, B in the panorama, surrounded by its associated remains, is the most imposing structure in America. With its rounded outlines and the massiveness of a natural hill, it yet presents on close inspection clear indications of its former wholly artificial and symmetric character. It is a truncated pyramid, nearly 180 feet high above its immediate base, and perhaps a little more than that above the floor of the Pathway of the Dead, or the general level of the plain. It is about 700 feet square at the base, though the measurements given are hardly more than estimates, as the lower parts are covered with vast accumulations of debris. The slopes did not vary greatly from 45 degrees, though now appearing much less than that. Terraces are still seen at three levels; that on the west side, facing the Pathway of the Dead, occurs nearly midway in the slope and is between 20 and 30 feet wide; the others are quite narrow. The summit is not far from 100 feet square, but is now too much broken down to be accurately measured. Remains of a zigzag stairway are said to have been observed on the east face, but as with the other pyramid, analogy would lead to the surmise that the real stairway was on the west side, thus giving a more direct descent from the summit temple, which we assume must have existed, to the great central artery of the city.

The facing of selected and in cases roughly dressed stones is seen in place at several points, and the interior of the mass is of irregular deposits of earth and stones, much as in the other mounds.

The much broken terrace or embankment surrounding the base of this pyramid is something like 200 feet wide on the north, south and east, and somewhat less than this on the west facing the roadway where it connects with the terraces and pyramid masses extending to the north and south. The outer margin is a little higher than the inner space next the pyramid, and was occupied, as in the Citadel group to the south, by lines of small pyramids now nearly obliterated by the plow. The suggestion afforded by the group as a whole is that of an inclosed court, the central structure in which has developed by degrees to occupy nearly the entire space.

COURT OF THE BATTERED GODDESS. An important feature of the ancient city was the great court (C) lying at the south base of the Pyramid of the Moon and opening into the Pathway of the Dead. It is 600 or 700 feet square and is surrounded by a line of imposing mounds, above which on the north towers the Pyramid of the Moon. Near the center is a low mound, the wreck of an

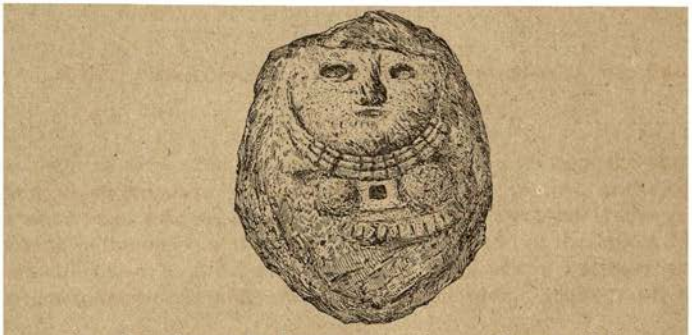


FIG. 105. MUTILATED FIGURE OF A DEITY. HEIGHT, 6 FEET.

inferior pyramid, whose position would indicate that in former days it probably had an important part to play in the affairs of the city. Not far from its south base is the overthrown and much mutilated figure of a goddess, described in a former paper* and illustrated in Fig. 105. On the west side of the court, behind the first line of mounds, was found the large idol recently removed to the Museo Nacional; it also is described in the above mentioned paper, and is here shown in Fig. 106.

CAMINO DE LOS MUERTOS. Opening out of the great court to the south is the so-called "Pathway of the Dead" (D), a depressed way varying from 200 to 300 feet in width and extending a little west of south (15 degrees) to the Arroyo of the Rio San Juan and continuing beyond into the fields surrounding the modern village, a distance of

* Monoliths of the San Juan Teotihuacan. American Journal of Archæology, Vol. I, No. 4.

PL. XLVIII. VIEW LOOKING EAST ALONG THE PATHWAY OF THE DEAD.

The point of view is in the middle of the Pathway opposite the Pyramid of the Sun, which structure is beyond the limits of the picture at the right. The modern stone fence running along the middle of the Pathway is also seen in the view looking in the opposite direction from the Pyramid of the Moon, Pl. XLVII. This pyramid is seen in the distance. At the sides of the Pathway are lines of rounded mounds representing the ancient structures. Photograph by W. H. Jackson.

VIEW LOOKING EAST ALONG THE PATHWAY OF THE DEAD.

nearly two miles. Though this pyramid-bordered way presents the appearance of a roadway, it is not truly a thoroughfare, being crossed by low embankments and interrupted by pyramids at several points. The name given appears to have no particular significance, yet it

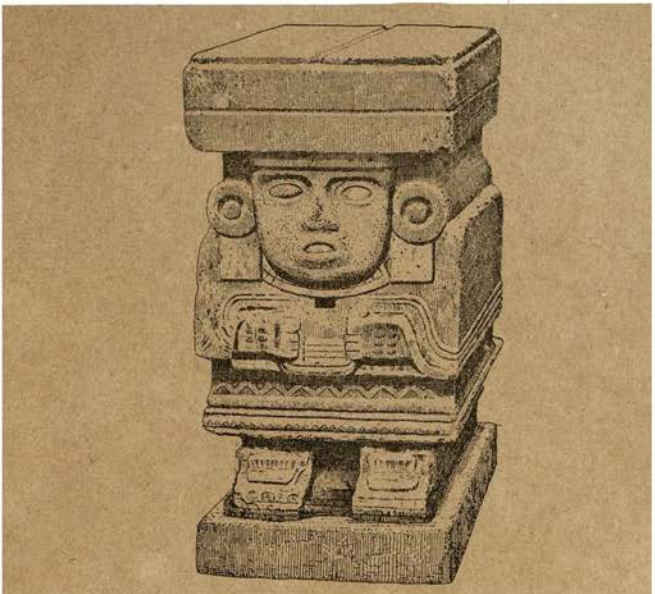


FIG. 106. FIGURE OF A DEITY. HEIGHT, 11 FEET.

serves in a way to express the idea, suggested to all minds, that this Pathway, in connection with the court, must have been the scene of no end of rites and pageants in which human sacrifice was possibly a central feature.

The pyramids, mounds and terraces, ranged in almost unbroken lines along the Camino, rise to a height of from 10 to 30 feet (Pl. XLVIII), and behind these front tiers, on the east and west, are innumerable piles, quadrangular or irregular in arrangement; and isolated remains extend far out over the plain, reaching San Martin on the northeast and San Juan on the south. The panorama can only suggest the multitude of remains, as the eye fails to clearly perceive, even with the aid of the field glass, forms so reduced by the plow and so obscured by crops and foliage.

THE SOUTH SIDE GROUP OR CITADEL. The Arroyo of the San Juan was undoubtedly bridged at the crossing of the Pathway of the Dead, thus connecting the north with the south side. The great quadrangular group named the Citadel (E) lies on the east side of the

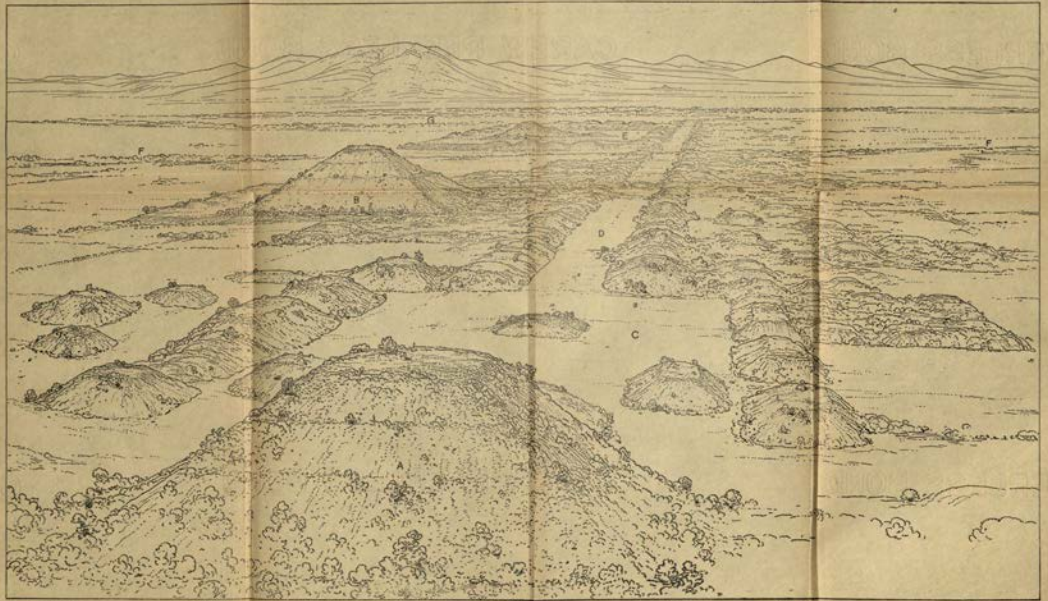
Pathway, 500 or 600 feet south of the banks of the Arroyo. It consists of a rectangular inclosure about 1,350 by 1,400 feet in extent, measured around the exterior base. The embankment is from 100 to 180 feet wide and from 10 to 20 feet in height. The four sides are surmounted by lines of mounds, four on a side, placed somewhat unsymmetrically near the outer margin. Within the court near the east side stands a pyramid, perhaps 200 feet square at the base and 60 feet high, having a projection or terrace built against the west base, while low embankments extend north and south from the pyramid connecting it with the inclosing ridge. A small pyramid stands quite alone a little to the north of the center of the inclosure. This grand group of structures is in an advanced state of ruin, the crumbling piles having been reduced to natural profiles by centuries of cultivation and herding, and no traces of the superstructures which must once have crowned the pyramids are now to be seen. Everywhere there are signs of ancient occupation; and systematic excavation on the site will certainly repay the explorer who may be so fortunate as to undertake the work.

TENOCHTITLAN—CITY OF MEXICO.

The Aztec capital, Tenochtitlan or Mexatl, was situated on the southwest shore of Lake Texcoco, in the Valley of Mexico, and was overthrown and practically destroyed by Cortez in 1521. This latter event may well be deplored by archeologists, for they have thus one less ruined city to explore, yet there is compensation in the fact that history has been enriched by the chronicles of the destroyers who built their capital on the site. Although all structures of importance were leveled with the ground, modern excavation brings to light many traces of the ancient time—foundations, sculptures, pottery, and deposits of refuse accumulated during the long period of Aztec and possibly pre-Aztec occupation.

I desire to do nothing more here than call attention to what is to me one of the most striking and wonderful features of the ancient remains of the Valley—the accumulation of refuse in several sections of the city, and especially in those parts now known as Nonoalco, San Simon and Santiago Tlalteluco, and which comprise a district extending from the Mexican Central Railway station two or three miles toward the northeast.

On a former occasion I made limited studies of these deposits, and some of the results are recorded in a paper published in the Trans-



A. Pyramid of the Moon. B. Pyramid of the Sun. C. Court of the Ruined Buildings. D. Pathway or Street of the Dead. E. Citadel. F, F. Cerros of San Juan. G. Location of San Juan Village.

PANORAMIC VIEW OF SAN JUAN TEOTIHUACAN.

MEXICO.

actions of the Anthropological Society of Washington* for 1885. My recent visit, made under the guidance of Mr. E. O. Matthews, extended over a wider area and brought to light far more extensive remains. In some of the fields where excavations of the soil for brick-making are going on, sections are exposed to the depth of 18 or 20 feet, and the entire body of deposits seems filled with the refuse of dwelling. In places the broken pottery is so abundant as to make up at least one-fourth of the mass. The prevailing variety of ware is extremely rude, and consists of simple cups and bowls with textile marked surfaces, with roughly shaped, slightly thickened rims and narrow, flattish bottoms. Mingled with these deposits are fragments of better made wares, with polished and painted surfaces, and near the top are countless numbers of broken and occasionally unbroken vases of the well identified Aztec types. Objects of various other classes are included, but pottery prevails to such an extent that it seems reasonable to suppose that here the ancient potters carried on their art, or that here were located the markets where from generation to generation the various food products of the valley were brought to be sold or prepared for consumption. Possibly this was the flower market where the gardeners of the "floating islands" and the extensive lake shores landed with their boats, using these rude, fragile vessels to transport and keep fresh the flowers of which the ancient natives are said to have been fond. It seems probable that a systematic study of these deposits would yield much valuable information respecting the culture status of the successive occupants of the valley, and it is much to be regretted that the work cannot be taken up by competent observers.

* Vol. III., pp. 68–81.

STUDIES OF ANCIENT MEXICAN SCULPTURE.

Yucatan and the southern states of Mexico are not rich in important sculptures aside from those embodied in architectural embellishment. It is quite different with the Valley of Mexico and adjacent sections of the great plateau, where large numbers of interesting and often elaborate and highly finished objects are brought to light from year to year. A survey of these sculptures shows that they served a multitude of purposes, that they cover a wide range of subject matter, and illustrate various styles of treatment and methods of execution. All, however, come well within the culture limitations of the historic nations of the province.

Among the more important classes of subjects independently sculptured are the human figure—entire or in part; animal forms—entire or in part; and compound and fanciful life-form conceptions of endless variety; these subjects are embodied also in masks, collars, tablets, calendars, cylinders, disks, boxes, vases and ornaments. The animal kingdom furnishes a vast majority of the motives, and every department is represented, mammals, birds, fishes, reptiles, insects and mollusks. Vegetal forms, though much employed by the Nahuatl painter, had little place in sculpture.

The Nahuatl lapidary was favored by nature in having at hand many varieties of workable and beautiful stone, and was thus encouraged to elaborate form and refine finish; whereas the Mayas had, in the main, only limestone, and this of a variety not well adapted to refined, æsthetic treatment. These conditions account, at least in part, for the greater diversity and beauty of non-architectural Nahuatl sculpture. A partial list of the stones used in the Valley of Mexico and the neighboring areas is as follows: onyx, marble, limestone, quartz and quartz crystal, granite, syenite, basalt, trachyte, rhyolite, diorite and obsidian. It is a noteworthy fact that the shaping of these varied materials required a wide range of technical resources, one nearly or quite equaling that employed by civilized nations, although devices were elementary and the peoples concerned were yet within the narrow confines of the stone age; stone was used to shape stone, save of course in cases where appliances for drilling, sawing and grinding involved the use of materials softer than those worked—such as wood, bone or native metal.

With the ancient Mexicans, as with all stone working nations, the shaping of brittle materials was accomplished by fracture processes—breaking, flaking and chipping; the tough, hard materials were reduced by battering processes—picking, pecking, percussion drilling, etc.; while the abrading processes—sawing, rotary drilling, grinding and polishing were employed according to the requirements of the shaping work; and incising methods served where the stone shaped was sufficiently soft to permit of their use.

The form of sculpture varies from the merest line engraving through all grades of low and high relief to the full round. The treatment has to do largely with surfaces rather than with absolute realistic forms, and the figure of the man is often a mere block with sculptured surface features, and the animal is worked out upon the surface of some bowlder or slightly modified natural mass. Sculptures embellishing objects of use are necessarily largely in low relief.

So far as the art displayed in these sculptures, aside from that of the mere stone cutter and lapidary, is concerned, there is nothing very remarkable, especially when we come to consider the commanding position of the Nahuatl peoples among the American nations. Proportion is not more correct, and expression is not more life-like than among numerous nations scattered along from Alaska to Argentine. In fact there is little in Mexico that can boast of a higher place in art—that exhibits more boldness and freedom of handling—than the strange carvings in both stone and wood of the primitive tribes of the Northwest Coast. It may not be quite fair, however, to compare carvings made by a modern people possessed of metal implements with works in stone of a stone-age people. The writings of the conquerors of Mexico make frequent mention of elaborately carved idols in wood, and such examples of ancient Mexican wood carving as have been preserved, display very decided skill. The latter are in the main reliefs, and the zapote-wood altar panel in the Temple of the Sun at Tikal, Gautemala,* is perhaps the finest specimen of sculptured relief yet brought to light in America.

In sculpture in the round, these plateau peoples seldom rose above the making of single figures, and these rarely reach any considerable degree of realism. True proportion was not appreciated, or was very generally disregarded, and this is true also of most of their relief and graphic work, as illustrated in the "Tizoc" stone and in the remarkable depictions of the codices; but in the Usumacinta province figures in stucco and stone are often in excellent proportion, as, for example, at Palenque on the pier fronts of the

* Charnay, Ancient Cities, p. 467.

Palace, in the stucco altar piece of the Temple of the Beau Relief and in the limestone tablets of the Temples of the Cross and Sun. In Palenque a good deal of skill and taste are shown in the grouping of two or more figures within a panel, these efforts at composition giving decided indications of advance toward higher planes of artistic development.

It is safe to say of Nahuatl sculpture, and of all other native sculpture for that matter, that it is largely of religious inspiration. Portraiture had not risen to a place of importance, and the æsthetic, though pervading everything, was not divorced from the symbolic. Whatever there is of grace and symmetry of form, whatever of elaboration and refinement of finish was, first of all, a tribute to the mysterious forces of nature personified in the various forms sculptured. Yet the influence of æsthetic notions was all-pervading; plain blunt statement was not enough; there was keen appreciation of the qualities of form regarded with favor by the highly cultured eye of the civilized world. In no group of works is this more apparent than in the realizations of the feathered serpent concept, where every line of head, body and feather embellishment is bold, graceful and telling. The exercise of taste is equally apparent in subjects where conventional decorative effects are secured by modifications and rhythmic repetitions of the parts of creatures embodied, as in the animal elements embellishing the curious stone yokes shown in illustrations accompanying this section.

Surface finish is no less a test of the æsthetic appreciations of the ancient sculptor. The harder stones were polished to the highest degree possible, while those not susceptible of such polish were finished in surface applications of fine clay or cement, which were colored and polished; and so thoroughly was the latter work done that many pieces still retain the enamel-like coatings. This application of color extended also to architectural sculptures and surfaces.

Among the monolithic sculptures of the Nahuatl province there are no works so colossal, so noble, so imbued with æsthetic feeling as are the great monoliths of Guatemala and Honduras; but considering all points I am inclined to place the compound deity "Huitzilopoctli-Teoyaomiqui" of the Museo Nacional, brutal and terrible as it is, very close to the head of the American list. Certainly, in their respective classes, the so-called calendar-stone and the great "Tizoc" disk outrank all others; and some minor sculptures, such as the polished diorite head of "Centeotl" or "Totec" in the Museo Nacional, are without rivals. However, when we come to look over the whole field of American sculptural achievement, architectural as well as non-archi-

tectural, composite and monolithic, we are forced to concede the palm for boldness of conception, for magnitude of proportions and infinity of labor involved, to the sculpture mosaics of Yucatan.

The minor works of sculpture, to which class the objects to be described in the following pages belong, are largely without pedigree; they are not definitely associated with any particular people or culture group, save in a most general way; many are absolute strays, picked up here and there without record of circumstance of discovery, and acquired by travelers and collectors and distributed to all parts of the civilized world. There is no possibility of future assemblage of these objects in any one place, and it must be regarded as in a sense the duty of all owners and custodians of such treasures to give them publicity—to publish descriptions and illustrations so that they may as soon as possible be the common property of those who are to write the history of the race and its art; and, what is also of much importance, that they may have the chance to gather about themselves such items of information as to origin as may accrue through publicity. In issuing the following brief descriptions of the sculptures that have come within my reach I aim at little more than to place the pieces illustrated within the reach of students. Critical and comparative studies of form, decoration and symbolism cannot be successfully conducted without full access to the literature of the subject, and without more complete and comprehensive collections than have yet been brought together. Publication of adequate descriptions of the specimens, along with proper illustrations, practically places them in all the museums, as well as in all the libraries, of the world.

ONYX TABLET WITH ENGRAVED FIGURE OF A DEITY. About the year 1895 there was brought to light by workmen digging an irrigating canal at Ixtapaluco, near Chalco, in the Valley of Mexico, an

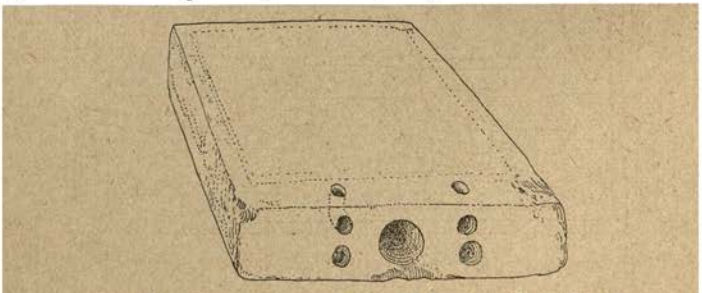


FIG. 107. PERFORATIONS IN UPPER END OF ONYX TABLET.

engraved tablet of remarkable character and, as it happens, of unique interest. It is a keystone shaped slab of onyx, 11½ inches long, 6½

inches wide at the wider end, and 1½ inches thick; it is drilled longitudinally and has four pairs of biconical perforations along the upper margin. Although it seems that its size would have precluded its use as a pendant, the marginal perforations are just such as are found in pendant ornaments, and it may be that this specimen was actually used on ceremonial occasions of exceptional importance; or it may have been intended for suspension on the breast of some idol. The position of the several perforations is indicated in Fig. 107.

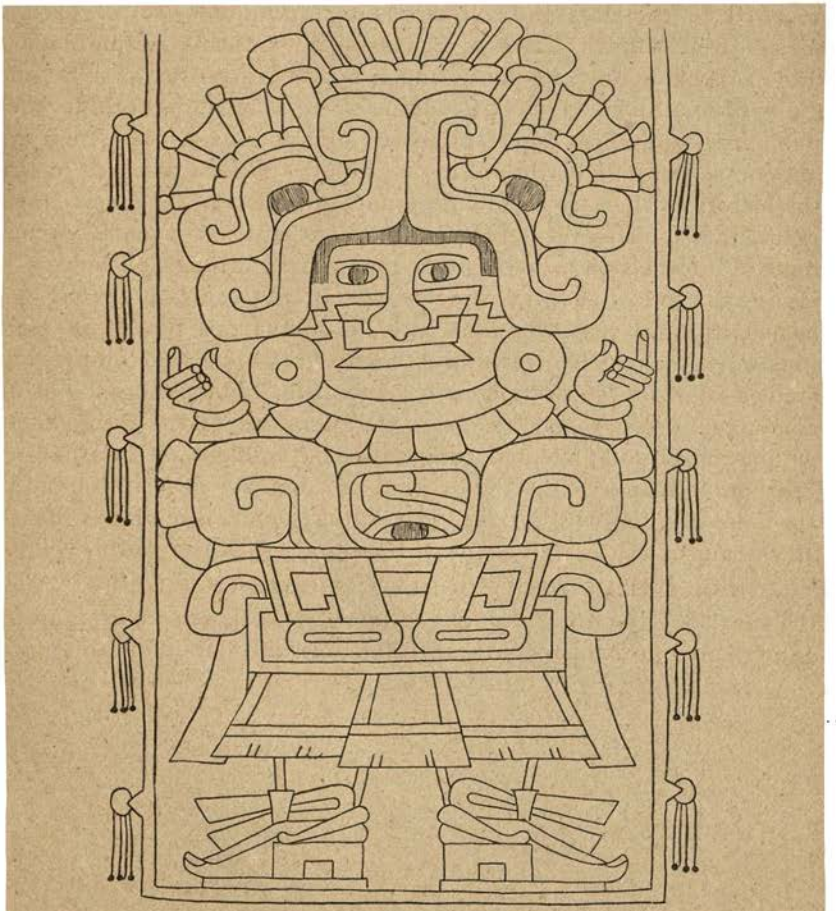


FIG. 108. ENGRAVED FIGURE OF DEITY FROM ONYX TABLET. ONE-HALF ACTUAL SIZE.

The engraved design is highly interesting and imparts much value to the stone, but the most important feature of the specimen was not discovered until after its arrival in Chicago. When taken from the box in which it had been carefully packed, it was found to be broken

directly across the face. The owner was naturally very much distressed by this occurrence, as the value of the specimen was apparently much impaired. Picking up the smaller fragment I proceeded to examine the longitudinal perforation exposed in section by the fracture, and to my surprise found the end of a tubular bone projecting from the opening. The conclusion was at once reached that this was the drill used in boring the perforation, and the value of the specimen was at once more than doubled. Fortunately, through the generosity of Mr. Armour, this tablet was secured for the Museum. It is made of pale-green, translucent onyx, somewhat laminated at the back where there is a layer of opaque whitish stone. The surfaces are well polished, and the front is occupied by a figure, which I take to represent some Nahuatl deity, engraved in sharp, shallow lines and with much skill and precision. The figure is framed in with a border consisting of a single heavy line and, at the sides and bottom, a second line outside of the first to which, at the right and left, are attached what appear to be representations of pendant tassels. The tablet is shown in Pl. L, and the engraved figure, traced from a rubbing, appears in Fig. 108.

The deity stands in formal fashion, full front view, with hands uplifted and feet turned out. The head is large and the body short—as is usual in works of this class—yet the whole figure is clearly and fully expressed, and with a minimum number of lines, selected and used with the skill of a master. The eyes are oval and the pupils are emphasized by means of scratched lines. The brows, nose and nostrils are expressed by a single continuous line; the mouth is covered with an angular device apparently suspended from the nose ornament. The latter is a bar bent up at the end connecting with lines which cross the cheeks horizontally and descend in zigzag fashion to the ears, or rather to the large discs with which the ears are embellished.

The head-dress is at once striking and interesting. It is strongly drawn, and consists exclusively of two highly conventionalized, but clearly expressed feathered serpents, whose bodies are joined above and terminate in a double row of feathers (representing the tails) against the upper margin of the tablet. The serpent bodies part over the forehead, descend at the sides of the face, and curve out over the ears in strong coils which represent the under jaws of the reptiles. The upper jaw is represented in each case by a similar strongly curved band which extends back over the head and incloses the eye; while above rises a formal feathered crown, and back of this, and forming a strong feature of the design, is a wand-like figure representing a rigid

ONYX TABLET WITH ENGRAVED FIGURE OF A DEITY. ONE-HALF ACTUAL SIZE.

plume or horn. The chin is encircled by the usual formal necklace with pendants, below which is a strongly drawn device crossing the chest and terminating against the margins of the tablet. It is clear that this device is neither more nor less than a condensed presentation of the twin serpent concept; the center piece consists of an eye and a single two-band coil, standing for the head or heads, while the bodies terminate at the right and left in feather-tipped coils. In this device, as well as in the head-dress, the designer has displayed great cleverness in simplifying the serpent forms to accommodate them to the space and use, but the convention has not proceeded so far as to entirely destroy continuity and normal relations of parts.

The belt, which is tied with a loop at the sides, and the short skirt below, are formally treated, the former exhibiting details—worked out in angular lines—that probably had some particular significance to the designer. The hands, with thumb turned back and index finger pointed upwards, appear at the sides. The ankles display conventionalized ties, and the feet, covered behind by pendant flaps, terminate each in a single great toe.

FIG. 109. BONE DRILL AS IT APPEARED IN THE BROKEN TABLET.

Proceeding to an examination of the drilled holes and the supposed bone drill, I first examined and sketched the projecting implement, which appeared as shown in Fig. 109.

Pouring water into the perforation to dampen the dark earth that clung to the sides and served to fix the bone tube in its place, I was at once able to press the implement back into the stone and, as the other end of the opening was larger, to remove it with ease. The finely comminuted earth was carefully saved for examination under the microscope. The hollow bone, Fig. 110-*a*, probably from the leg of a crane or other large bird, is 2¾ inches long and ⅜ of an inch in diameter. It is shattered and worn at the upper end, while the lower end or point has the appearance of having been freshly cut off. This latter feature was a matter of some surprise, as a drill point might be expected to show decided evidence of abrasion by use. I found, however, on the other hand, that the exterior surface of the tube

was scratched and striated as if by attrition with fine sand. On washing out the bore in the larger piece of stone, I discovered that the bone tube had not extended to the end of the boring from below, that in fact it reached only half way, and that the size of the hole diminished so that it could not enter farther. On cleaning out the earth the fact was developed that the borings from opposite ends of the tablet had not met accurately, as indicated in Fig. 110-*b*, and the conclusion was at once reached that the drill was probably being employed, when the work ceased, to enlarge the bore, with the intention of making more complete connection from end to end.

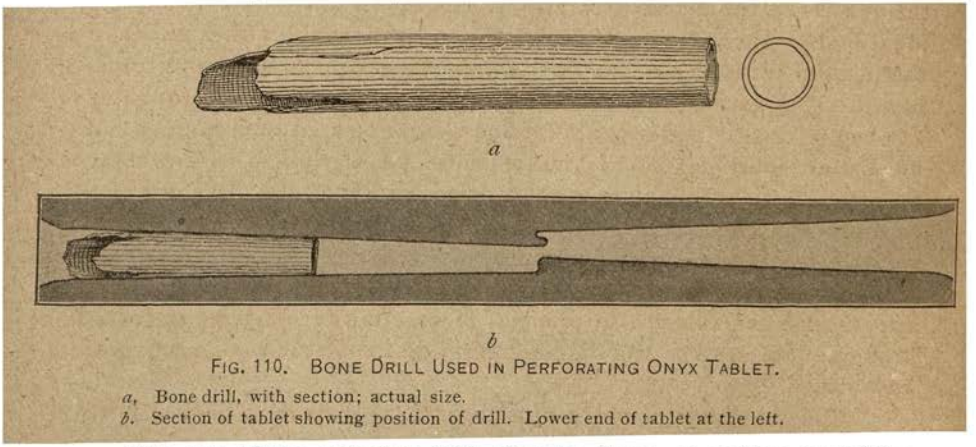


FIG. 110. BONE DRILL USED IN PERFORATING ONYX TABLET.

a, Bone drill, with section; actual size.
b. Section of tablet showing position of drill. Lower end of tablet at the left.

The use of the tubular drill of cane, bone or native metal by primitive peoples, and even by many well advanced nations, is well known. The tube was twirled by rolling between the hands, or by a pump or bow drill, and sand of suitable fineness and hardness was employed as the cutting agent. That a tubular drill was used in the present case is proved by the presence of a well developed core at the base of the boring from the upper end, as shown in the drawing, Fig. 110-*b*; and, though the proof may not be absolute that this piece of bone was actually in use as a drill, the probabilities are strongly in favor of the correctness of the assumption that it was so used, and it is also highly probable that in addition we have here a correct suggestion of the manner in which the tubular drill was employed in enlarging and straightening defective borings, a measure often necessary where devices were of such imperfect construction.

The sand obtained from the boring in and about the bone tube was submitted to Prof. O. C. Farrington, curator of geology, who kindly furnished the following report:

"The material submitted to me for examination was about $\frac{1}{10}$ of

a gram of a gray powder, mingled with a number of splinters of bone 2 or 3 mm. long, and coarse, rounded grains, 1 mm. in diameter, of a gray porous rock. Under the microscope the powder was seen to be made up of grains of various shapes and sizes from 8 mm. in diameter down. Most of these grains had sharp, angular surfaces and gave little evidence of wear. There were, however, a number of rounded white grains about 1 mm. in diameter. These effervesced, and were decomposed by both hydrochloric and sulphuric acid, giving crystals of gypsum with the latter. Some of these were identified by their porous structure as partly decomposed bone, while others seemed to be travertine. A few transparent grains were positively identified by their high double refraction as calcite. Other grains of the powder were black and opaque, and still others dark and translucent. The latter were isotropic, indicating that they were probably a volcanic glass. Some of the grains were attracted by a magnet, but no distinct particles of magnetite could be identified. By rubbing the powder with a pine stick on a surface of glass, the glass was perceptibly scratched, some grains cutting deeper than others. Slight scratches were also produced on a quartz crystal by the same treatment, indicating that some particles had a hardness of 7. The appearance and physical properties of the powder lead me to regard it as one produced by the disintegration of a volcanic rock, such as an andesite.

"The hardness of the grains is such as to make them a fairly good abrasive for a rock as soft as travertine, but there seems to have been in point of size or quality of the grains no special selection for this purpose."

SCULPTURED YOKES. Two examples of the handsomely sculptured objects, commonly classed as "sacrificial yokes," have recently come into possession of the Museum. One of these, illustrated in Fig. 111, is of the usual type, open at the base like a horseshoe, and forming an arch when set on end.* It is 15½ inches in height (length), and 14½ inches in greatest width. In section the inner surface is straight and the outer surface rounded, as shown in *a*, Fig. 116. The thickness from inner to outer surface is about 3½ inches, and from face to back, 4½ inches. The stone is a dark, greenish gray, very compact chlorite, and the surface is well and evenly polished. The carving is simple, and evidently incomplete; the form embodied, so far as it goes, is that of a frog or toad. The hind legs appear at the base of the arms of the yoke; the rounded body occupies the middle

* It may be well to state in this place that the normal position of these objects, when at rest—probably the position also when in actual use—is prostrate, and not erect as an arch.

of the sides, and the fore legs are partially defined at the spring of the arch; while the curve of the arch—usually, in similar yokes, carved on the upper surfaces to represent the reptilian head—is quite plain. The reverse or under face, which is somewhat narrower than the obverse

FIG. 111. YOKE OF CHLORITE, WITH PARTIALLY DEVELOPED FIGURE OF THE FROG. FROM MOTZORONGO, STATE OF VERA CRUZ.

or upper (front) face, is also without carving. A more fully developed example of the same class of yoke is shown in Pl. LI. In this specimen the crown of the arch is carved to represent the reptile's face—illustrated in *a*. A face view of the yoke is given in *b*, and a side view, with the head of the reptile at the left, appears in *c*. In other yokes of this particular type the reptilian features are still more fully elaborated and realistic, while in others still the treatment is highly conventional and decorative. The reptilian motive is also, at times, combined with other concepts, as the bird and the man, indicating complexity of symbolism.

The second specimen, illustrated in Pl. LII, is a unique and remarkable work, and certainly one of the most elaborately and artistically embellished yokes yet brought to light. The material is a hornblende

STONE YOKE CARVED TO REPRESENT A FROG. ABOUT ONE-FOURTH ACTUAL SIZE.

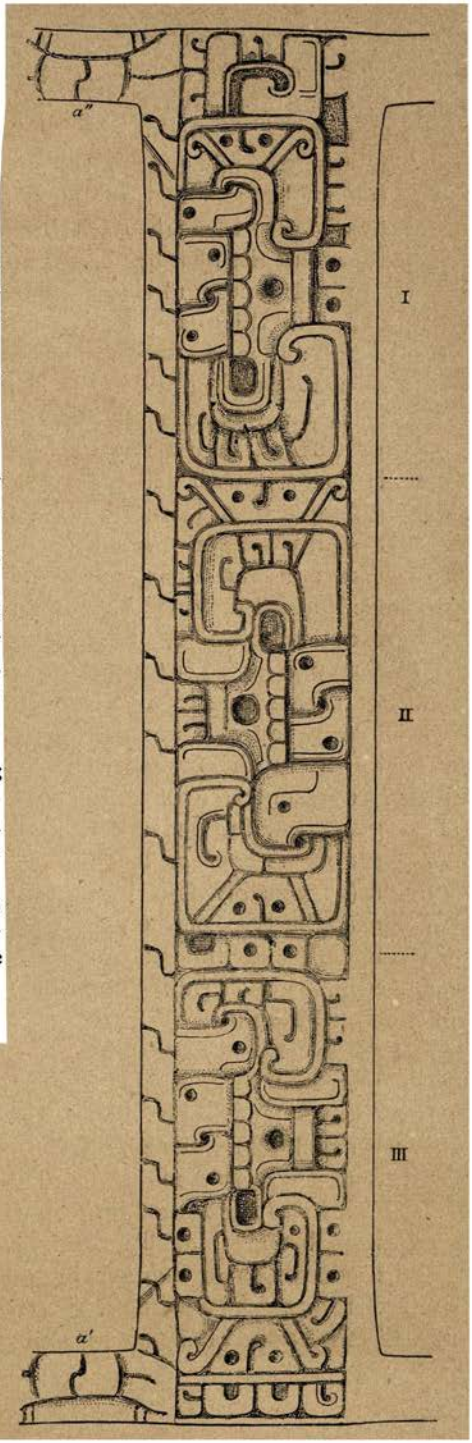


FIG. 112. COMPLETE DESIGN FROM THE SCULPTURED YOKE ILLUSTRATED IN PL. LII.

The various parts of the design are readily correlated with corresponding features in the four figures of the plate. The four units of the design are marked I, II, III and IV. The connecting segment (IV) is shown separately and in perspective to make clear the relation of parts.

The connecting band of the inner margin of the yoke—filled in with S-shaped lines as if to represent a twisted band or the belly of a serpent—appears at the left in the main figure, *a'* joining *a''* as indicated at *a* and as seen also in the front view (upper surface) of the Yoke, Pl. LII. The opposite margin (under surface) is plain.

The middle section or unit (II) occupies the upper curve of the arch; its devices are repeated with modifications in the other sections, that on the lower end being considerably abbreviated.

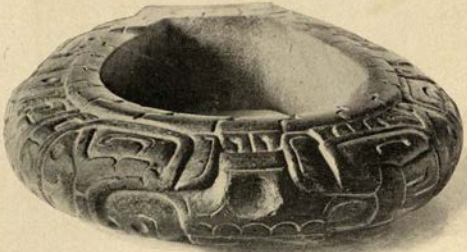
A system of alternation of parts is carried on throughout the whole design, as best indicated by the relative position of the rows of teeth.

andesite, showing numerous angular fragments included in the light grayish-green matrix. It is unique in being closed at the base, and in its striking approximation to a common leathern horse-collar in appearance. It is slightly larger than the average yoke, measuring 21½ inches in height (or length) and 15½ inches in greatest width. The thickness, from face to back, on the inner margin, is 4 inches, and the distance through, from inner to outer surface, is about 3½ inches, save at the base or narrow end, where the connecting segment —flat on both faces and slightly incurved on the end surface—is but 2½ inches in thickness. The section of the connecting segment is rectangular; that of the arch is straight on the inside, and approximates a semi-circle on the outer surface (*b*, Fig. 116). The flat inner surface is entirely even and symmetric, but is not polished; the exterior surface, save a narrow, inner, marginal band on the under side, is covered with relief carvings, and with the exception of the deeper depressions, is highly polished.

It is fully apparent that the carvings of the exterior surface of this yoke embody animal motives, but they are very highly conventionalized, and I may add, are of an order of elaboration both surprising and admirable. There is not an animal feature recognizable to the inexpert eye, yet to those in a measure initiated into the mysteries of native American conventional art, there is no part that is not certainly representative and significant. All the features are well brought out in the four views assembled in Pl. LII, and in the projected representation of the sculptured designs given in Fig. 112. Taking as a key the line of dentate figures which appears to represent the teeth of the creature or being embodied, we find that four individuals (or possibly four pairs of the motive) are included. One appears at the crest of the arch (II, Fig. 112), one at the middle of each side (I and III), and one on the concave surface of the base or connecting segment (IV). The row of teeth forms the central feature of each of these units.

I do not expect to be able to identify fully or explain the numerous elements of this design, which evidently represent the various parts—head, mouth, eyes, body, appendages and markings—of the life form embodied, as the conventional transformation is so complete that the specimens at hand do not furnish a satisfactory key. It is highly probable, though, that if all known examples of these yokes were brought together, the designs of one would supplement and explain those of another in such a way that the main devices could be interpreted and referred to their original life motives, and that all the dropped links could be restored.

d



c

a

b

FOUR VIEWS OF A SCULPTURED YOKE FROM MOTZORONGO, STATE OF VERA CRUZ. ONE-FOURTH ACTUAL SIZE.

At first glance I was impressed with the idea that the creature embodied was the serpent. It appeared that the inner band of the face (upper surface) of the yoke inclosing the aperture, with its S-shaped dividing lines (seen to best advantage in *a*, Pl. LII), might represent the abdominal surface of the reptile, serving to connect the four conventionalized representations of the creature, occupying the outer or convex surface of the object, as a single concept; and possibly that, in addition, the serpent idea might be combined with that of a plaited or twisted band or tie, serving not only to unite the concepts of the outer surface, but to tie up whatever the yoke, in its mysterious use, was employed to hold together or restrain. On looking farther, I found the devices of the convex surface quite varied and complex, and concluded that it might be unwise to try to identify them all with any single creature or concept. The central idea in each unit—represented by the row of teeth—is apparently that of death. This particular treatment of the teeth—the fully uncovered row being shown—characterizes the death's head, a symbol of death among the ancient Mexicans generally. The associated figures evidently represent, more or less definitely, various animal features. All of these features may belong to the supposed figure of death, but they may pertain to other motives associated with the death symbol. When conventional modification has gone as far as it has in this case, the individuality of the features of the original is necessarily, in a great measure, lost; an eye, for example, is a generalized eye; a mouth, a generalized mouth. The normal relations of the parts are also modified to suit the spaces occupied; features that belong together may be separated, others may be joined that belong apart, while others still may be omitted and lost sight of. Notwithstanding these various modifications, rearrangements and omissions, we may assume that the people interested understood the meaning and associations of the symbols as well as when pronounced realism served to recall the original idea to the mind. But the key is wholly unknown to us, and we cannot expect to do much more than to obtain a general idea of the elements employed, and the methods of their assemblage and modification in art.

Taking the simplest possible view of the case in hand, namely, that the central idea involved is the death symbol or concept, embodied in or associated with a reptilian form, a somewhat detailed study of this remarkable yoke may be made. Beginning with the row of teeth, which forms the central feature of each unit of the design, we find its associated forms are much alike in I, II, and III (Fig. 112) but that in IV, on account of the limited space, the forms are much

curtailed. Taking II, which occupies the crest of the arch in the yoke, and following the normal order of features as they occur in the less highly conventionalized reptilian sculptures—as seen for example in the upper figure of Pl. LI—we would have as the most essential idea the mouth, represented by the teeth, and apparently also by a depression at the right, possibly the corner of the mouth, inclosed by curved forms of peculiar character, suggesting the beak of a bird. At the left, however, we fail to find this depression, so that if it really represents the mouth, we must conclude either that a profile view is intended, or that the normal symmetric arrangement of features has given way to the necessity for crowding. Above the mouth we naturally look for the nostrils but find only a single and very pronounced depression; this may be intended to represent the nasal opening as it would appear in the skull, where it is practically a single opening; thus it happens we have an additional hint that the death symbol might have been intended. At the right and left of the rounded pit are rather obscure graded depressions which probably stand for the eyes, or for hollows beneath them, while the relieved, somewhat oval forms overhanging these, would be the lids or the staring eyes themselves. Between these features, and extending from what I take for the nasal ridge to the upper border of the design, are minor markings that probably represent crest plumes, often seen in reptilian representations.

Beneath the row of teeth is a group of devices consisting of three infolding or intertwined parts that appear to represent the tying or interlacing of two forms—apparently reptilian bodies—that issue to the right and left and coil upward enfolding the head. The division of these coils into a narrow and a broader band and the occurrence of various appended features at the right and left and above, probably representing plumes and possibly also rattles, would tend to confirm the idea that the serpent was intended, but the markings of the body suggest the conventional treatment of the body of the frog rather than of the serpent; it is not impossible, therefore, that the frog and serpent motives are combined. At the upper end of the design, as placed in Fig. 112, there is an addition to unit I—a body coil with appendages—that serves apparently merely to fill out the space.

A study of the conventional treatment of the serpent in the onyx tablet design, Fig. 108, will prove instructive in this connection. The body curves of the serpents in the head-dress of the engraved figure show analogies with the supposed serpent bodies in the closed yoke design, and the abbreviated and compounded serpent device, crossing the chest of the onyx tablet figure, resembles the yoke design in several particulars.

Having at hand but a small number of these yokes and possessing few other examples of the symbolic and decorative art of the culture province represented by them, the task of tracing the conventional elements is difficult and unsatisfactory; I shall therefore for the present content myself with presenting two or three additional yokes, in the sculptures of which interesting and suggestive analogies appear.

A handsome yoke described and illustrated by Strebel in his *Alt-Mexico** is of interest in this connection and a face view of the specimen, copied from his Pl. XV, is given in Fig. 113. A portion

FIG. 113. FRONT OR FACE VIEW OF STONE YOKE COPIED FROM STREBEL.
The head of the bird, facing downward, occurs on the outer surface of the arms, the five crest plumes only appearing on the face. Found in the state of Vera Cruz.

of the sculptured design, worked together from the three views of the specimen given in his work, appears in Fig. 114. As seen in the latter illustration the figure of a bird—an eagle or possibly a buzzard—occupies the lower part of each arm. The head is on the outer surface of the arch, and the five plumes of the crown appear on the face. The dotted line in Fig. 114 separates the parts belonging to the outer surface from those of the face. A second and smaller head occupies the crown of the arch, and is seen in the same figure. I wish to call attention first to the manner in which the birds'

* Hamburg, 1885.

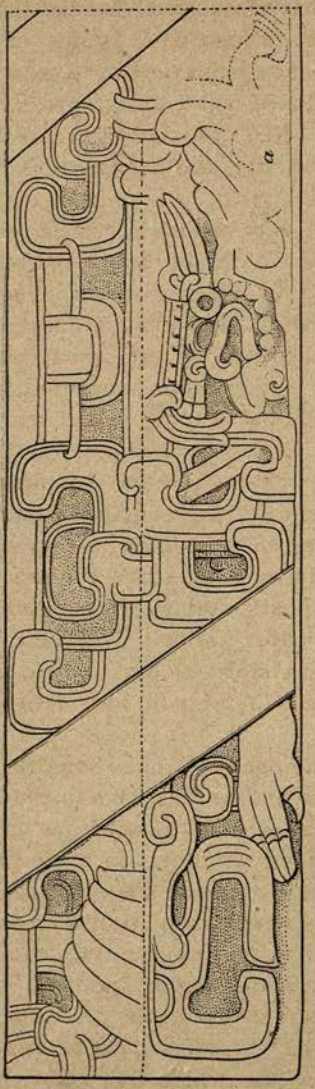


FIG. 114. DESIGN FROM THE STREBEL YOKE PROJECTED ON A PLAIN SURFACE.

The birds' heads occur the larger at the base, and the smaller at the crown of the arch.

FIG. 115. DEVICES OF THE CLOSED YOKE SIMPLIFIED TO SHOW ANALOGIES WITH DESIGNS ON THE STREBEL YOKE.

heads grade off into formal scroll patterns, and to the fact that a very little additional conventionality of treatment would reduce them to purely formal, though necessarily eccentric, scroll work; and, second,

that these bird motives as well as their attendant scroll devices display striking analogies with the highly conventionalized figures of the closed yoke. These analogies will be made apparent by a comparison of Fig. 114 with portions of the closed yoke design given, in a somewhat simplified form, in Fig. 115. The association of the bird motive with the devices accompanying the death symbol is thus distinctly suggested.

The various devices sculptured on the surfaces of these yokes may thus be studied from the point of view of the life forms embodied, or they may be examined with respect to the symbolism involved. On the latter point, however, we can secure but meager data. We observe that the sculptures vary with the locality and conclude that the symbolism varied with the communities or tribes concerned, and, possibly with successive periods of national history. We see that in one case the devices are simple and in another complex, and surmise that the symbolism was varied and probably in cases complicated. Observing that the frog occurs frequently we conclude that the symbolism may relate to water. Seeing that the bird is sometimes embodied we surmise that there may have been some reference to the air. The feathered serpent also appears and we recall that this favorite concept had to do with both water and air. These are of course mere suggestions, but the present state of our knowledge of Mexican symbolism and its embodiment in art will not justify any attempt at positive determinations.

Turning attention to the objects themselves I have sought hints of symbolism in the shapes, but in nature find no arch save in the rainbow and in the sky; and in art only one suggestive parallel has caught my eye. In the beautiful zapote altar-tablet found in a temple at Tikal, Guatemala, a human figure sits or squats beneath an arch formed of the body of a two-headed feathered serpent; the necks of the monster are bent outward and rest on the ground, and the mouths—curiously elaborated—extend to the right and left. The heads strongly suggest some of those seen in the yokes and it may be that the same or similar ideas are involved. Observing the presence of water and air symbols in these various sculptures I am led to think of the arched forms as possibly symbolizing the rainbow, and of the whole group of subjects as possibly relating largely to the rain god Tlaloc or some of his analogues.

Again these devices may be examined from the point of view of embellishment merely. The symbolic use of life forms in art leads inevitably to the conventional treatment of these forms; and continued use transforms them completely. The graphic symbol stands at one

end of the line and the purely geometric derivatives at the other. These changes are brought about largely by technical agencies, but there is also from first to last a constant supervision by the æsthetic forces, and these gradually take possession of the motives and their application to the objects treated. Symbolism is not necessarily lost as the change from picture to formal device takes place, but when employed in non-symbolic associations confusion of symbols necessarily results and embellishment has everything its own way.

The examples of transformation of symbols furnished by these yokes are especially interesting. The devices of the closed yoke have passed almost completely beyond the limits of the graphic phase, although they are by no means reduced to perfect formality. Realism is lost, but certain original characteristics of shape and arrangement are still present, giving to the whole embellishment a striking individuality. The reliefs are high or low, the curves strong or weak, the lines long or short, involved or simple, according to the parentage of the element embodied. Though the symbolism had certainly not been lost sight of, the æsthetic forces were in almost complete control of the forms of expression.

In the Strebel Yoke the birds' heads are distinctly recognizable, yet a very little additional modification would make identification by the inexpert eye quite out of the question. The foot associated with one of the heads is still decidedly graphic but the bodies cannot be traced and the spaces naturally taken by them are occupied by derivative scroll work of striking and original character. This example shows that transformations of motives do not take place uniformly, and this mobility is an interesting feature of the progress of conventional modification.

A fine yoke preserved in the National Museum at Washington is sculptured to represent a reptile—probably a frog. The body is treated with a considerable degree of realism, but the head is elaborated in an extraordinary manner, and is more that of a serpent or alligator than that of a frog. The head-crest consists of five plumes which extend up over the face of the yoke as in the Strebel specimen, thus again definitely associating the reptilian and the avian concepts. Similar monsters are common elsewhere and especially in the sculptures of Copan and Quirigua, although in the south the bird element is less prominent or is associated in different ways.

In a yoke belonging to a private collection in the City of Mexico, the form of the frog is developed in a simple manner almost duplicating the specimen shown in Pl. LI, but the body of the creature is entirely covered with beautiful tracery. This tracery is evidently an

elaboration of the scroll-like motives employed in the closed yoke, and in a more decidedly conventionalized form in the bird yoke figured by Strebel. This specimen displays two wholly unique features; it is observed, first, that the tracery, treated in a highly decorative manner, is carried over the entire inner surface of the yoke; and, second, that the end of each arm of the yoke is occupied by a neatly sculptured human head in low relief; these heads are framed in by the tracery volutes, which probably represent the mouth of some mythical creature, since in several other cases human visages similarly placed are seen to be issuing from the mouths of reptiles somewhat realistically treated.

Considering the number of these objects and their importance as works of art it is certainly remarkable that nothing is known of their use, and that they do not appear to be represented in any of the ancient manuscripts or in any of the thousands of subjects engraved or sculptured on stone or painted on or modeled in clay. That they were sacred and symbolic and had some important office to fill in gaming or devination, in rites or ceremonies, requires no proof beyond that furnished by our knowledge of the culture of the people to whom they belonged. Numerous definite uses have been assigned to them but I can see no sufficient reason for adopting any one of these rather than another, and it is quite probable that the real use has not yet been guessed, save perhaps in the most general way.

The idea that these yokes were used in human sacrifice as an aid in restraining the victim while his heart was torn out by the officiating priest has been pretty generally adopted—a result due no doubt to the collar-like shape of the objects, combined with the fact that they occur in the general region in which human sacrifice was so extensively practiced. But there is really nothing in the shape to suggest such use. They could not be adjusted conveniently to any part of the human frame—either the neck, the body, or the limbs, and might prove a decided disadvantage in the work of restraining the unfortunate victim. Brinton suggests* that they may have served the sport-loving natives in the playing of some game of ball. Ernst, and, I believe, Strebel, favor the theory that they were memorial tokens of some great individual achievement worn on certain ceremonial occasions as symbols of dignity or power.

The strange stone collars found on the island of Porto Rico are the only relics of the ancient time that seem to bear any close analogy with these Mexican specimens, and their use is equally a matter of speculation.†

* Science, March 10, 1893.

† Mason, O. T. "The Guesde Collection." Report of the Smithsonian Institution, 1884.

A study of the manner of use, as indicated by the shape, contributes little toward solving the riddle of these yokes. Strebel argues correctly that their normal position is a horizontal one. Few of them are shaped to stand on end without extraneous support and in some cases the ends of the arms are covered with relief sculptures in continuation of the designs of the face and sides. That the horizontal position was the normal one is shown more forcibly still by the position of the animal forms embodied; these are so placed that one face may with safety be regarded as the upper face and the other the under face; the former is covered usually with sculptures and the latter has that portion of the surface which would rest upon a flat support quite plain. It is a noteworthy fact that the under side is narrower than the upper side—as shown in the profiles, Fig. 116—a

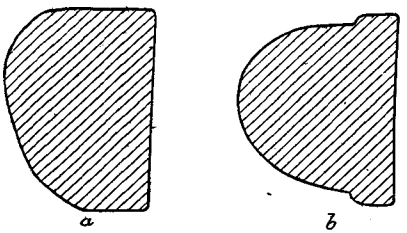


FIG. 116. SECTIONS OF THE YOKES SHOWN IN FIG. 111 AND IN PL. LII.
One fourth actual size.
a. Section of Yoke illustrated in Fig. 111.
b. Section of Yoke illustrated in Pl. LI.

specialization of shape common to all forms and all localities and certainly not without special significance.

Although these yokes seem to stand alone as the product of a particular region, and presumably of a single people or ethnic group, the designs associated with them are not so restricted. The latter belong to a school of aboriginal mythologic art, localized somewhat definitely in the eastern central districts of the great Mexican plateau, but grades off into various neighboring schools. The work does not seem to affiliate so closely, however, with the sculptures of the Valley of Mexico as with those of the Maya-Quiche provinces. In its general style it is repeated throughout Mexico, is echoed in the simple art of our Southern States and again on the North-west Coast; it also has significant affinities with corresponding lines of work in eastern Asia and the Pacific islands.

It would seem that these yokes are most numerous in the states lying directly east of the Valley of Mexico, and few have been found outside of the borders of Puebla, Tlascala and Vera Cruz. The Strebel specimens, as well as the two owned by this Museum, are from

this region. The Dorenberg collection, brought together largely, I believe, at the city of Puebla, contained half a dozen examples. It has been stated that one specimen was found in Oaxaca and another in the Valley of Mexico, but I am inclined to ascribe them all, at least originally, to the one district.

CYLINDER WITH SERPENTS IN RELIEF. The disk or cylinder shown in Pl. LIII-*a* is a handsome example of its class, sculptured from a reddish-gray, compact andesite. It is 7 inches in height and 11 inches in diameter. The upper and lower surfaces or ends are plain and not carefully dressed, leading to the inference that the stone may be the section of a column or of some columnar structure. The periphery is encircled by two feathered serpents in low yet boldly handled relief, their open jaws and protruding tongues meeting on one side (at the left in the figure) and the feathered tips of their tails on the opposite side. The borders above and below imitate plaited fillets.

I have had the sculptured periphery cast and projected on a plain surface so that the whole subject can be seen at a glance, and that the highly artistic arrangement of the feathers, body and rattles, as well as the nice treatment of the relief, may be fully apparent. One of the serpents reproduced from the plaster cast is shown in Fig. 117. This association of a pair of serpents is a very usual one

FIG. 117. FEATHERED SERPENT IN RELIEF, OCCUPYING THE PERIPHERY OF A CYLINDER.

throughout Mexico, and even far beyond its limits, and without doubt had special significance to the sculptors. Brinton has expressed the opinion that the association is calendaric, relating possibly to the union of cycles of time.

A comparison of the manner of delineating the serpent in the various regions is interesting; although the differences are striking and varied, the analogies are numerous and marked, suggesting the practical identity of the feathered serpent myth among the whole

group of nations. Among the many peculiar features of the mythic serpent concept is the coil which issues from the corner of the mouth and rests against the jaw. This is a very constant feature, and apparently not traceable to any definite original in the serpent itself or in any other known creature.

ANNULAR STONE WITH RELIEFS. The stone ring shown in Pl. LIII-*b* is made of dark, somewhat scoriaceous andesitic lava, and is 18½ inches in diameter and 10 inches thick. The workmanship is inferior, the shape is not symmetric and the sculpture is extremely crude. The periphery is encircled by the devices drawn out in Fig. 118; these embody varied animal features so poorly defined and so mixed up that little can be made out of them. Among the figures is one of a monster that seems supplied with flippers or jointed claws resembling those of a lobster. The under surface, as placed in the plate, is plain and somewhat rough, while the upper surface is occupied by a cosmic device, very simple and crude, shown in Fig. 119.

STONE BOX WITH RELIEFS. A very well shaped and handsomely sculptured box is illustrated in Pl. LIV. It is made of dark, somewhat porous, basalt, and is 14½ by 15½ inches square and 10½ inches in height. The walls are 2 inches thick and the rim is shaped to accommodate a lid, which is missing. It is evident that the box has been in recent use, probably as a watering trough, for a notch is broken out of the rim on one side as if to fit a supply spout, and a hole has been drilled in the base at the opposite side apparently for drainage. The exterior surfaces are sculptured with much care, as shown in the plate, the figures without doubt being significant. The principal band of devices shows two square compartments on each side, within which are corner projections and a central disk—probably calendaric devices; above is a marginal band with circlets; below are two plain bands and

FIG. 118. BAS-RELIEF FROM PERIPHERY OF THE ANNULAR STONE SHOWN IN *b*, PL. LIII.

PL. LIII. *a*. CYLINDRICAL STONE WITH BAS-RELIEFS.

The upper and lower surfaces of this object are plain, and the periphery is occupied by two conventional feathered serpents in low relief placed face to face, the open mouths meeting as seen at the left. The borders above and below represent plaited bands. One of the sculptured serpents is shown in Fig. 116. Diameter, 11 inches.

PL. LIII. *b*. ANNULAR STONE WITH BAS-RELIEFS.

The upper surface has radiating calendaric devices dividing the circle into four and eight parts, and the under surface is plain. The periphery is covered with rude conventional reliefs representing animal forms; these are difficult of identification. The sculptured devices are shown in Figs. 117 and 118. Diameter, 18½ inches.

a

b

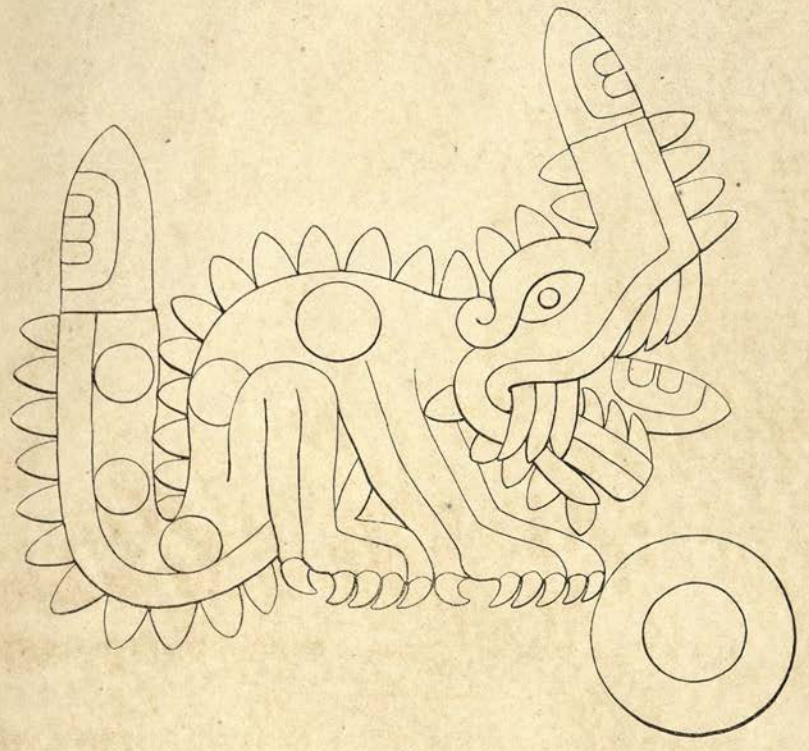
a. Cylindrical Stone with Bas-Reliefs.
b. Annular Stone with Bas-Reliefs.

PL. LIV. STONE BASIN WITH CALENDARIC BAS-RELIEF SCULPTURES.

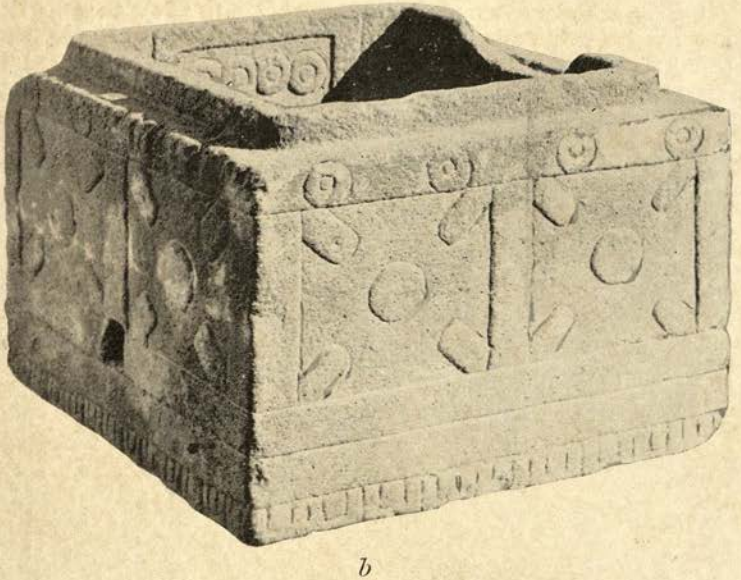
a. Box made of dark, basalt-like rock, and handsomely sculptured. One-fourth actual size.

b. Figure of monster in low relief on bottom of box (inside). Length 9 inches.

The four calendaric devices sculptured on the sides of the box within are shown in Fig. 120.



a



b

STONE BASIN WITH CALENDARIC BAS-RELIEF SCULPTURES. ONE-FOURTH ACTUAL SIZE.

a marginal space occupied by "egg and tongue" figures, probably originating in Mexico in the feathers of the plumed serpent. The four walls within contain neatly sculptured symbols of the four

FIG. 119. DEVICE OCCUPYING THE UPPER SURFACE OF THE STONE RING SHOWN IN PL. LIII-*a*.

seasons—the rabbit, the house, the flint and the cane (Fig. 120)—while the bottom is occupied by the figure of the flint-bedecked

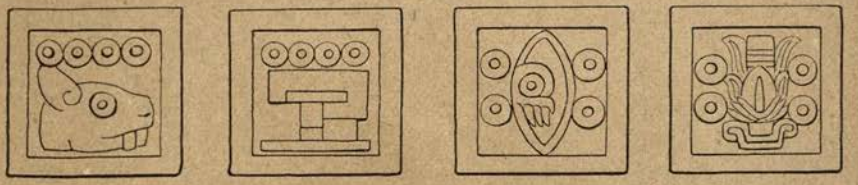


FIG. 120. SYMBOLS OF THE FOUR SEASONS SCULPTURED ON THE INNER WALLS OF THE STONE BOX.

monster of the lower regions, shown in outline in the plate. Doubtless the lid was also handsomely sculptured with devices symbolizing the sun or representing some mythic concept. The specimen was found near the City of Mexico.

HEAD OF DIORITE. A choice bit of lapidary work is illustrated in Pl. LV. It is an ovoid mass of blackish, speckled diorite carved to represent a human head. The height is 8 inches, the width 6½ inches and the depth 5½ inches. The features and embellishments are well worked out and the whole surface is highly polished. The face is framed in by the conical crown above, by decorated pendant bands at the sides and by the necklace beneath the chin. Against the cheeks are carved ear ornaments of the usual annular type. The only

features of the visage having special significance are the four tusk-like pendants issuing from the mouth and covering the chin. These appear to indicate that some rain god, possibly Tlaloc, is represented.

I observe with respect to the manipulation of the surface that different tools have been used according to the form to be defined. A tubular drill, 9-16 of an inch in diameter, was employed to cut the circlets for the ear ornaments and the beads of the necklace. The straight lines are cut with a directness and precision that indicate the use of some well arranged mechanical device, such as a rotary saw, rather than a tool operated by the unaided hands. The grooves and channels have clean-cut surfaces and a polish apparently not secured by an after process, but as the direct result of the shaping operations. The finish of irregular lines and general surfaces is the result of mixed processes, the polish having been given by hand. The back, as indicated in the second figure, is rounded and smooth. A shallow channel extends vertically across the middle, and this is so related to slight depressions above and below as to strongly suggest the idea that the intention was to suspend the stone by a heavy cord, the depressions being just sufficiently pronounced to allow the knottings of the cord to take hold.

As to the object or use of this stone, little can be said, save that it probably served as an amulet. It was found in the year 1896, 15 feet beneath the surface of the dry bed of lake Texcoco by workmen engaged in digging a drainage canal 3 miles long, 50 feet wide and some 25 feet deep, intended to drain lake Chalco into lake Texcoco.

FEATHERED SERPENT IN GREENSTONE. By far the most valuable specimen of early Mexican sculpture so far acquired by the Museum is a feathered serpent, with associated motives, executed in dark green, mottled diorite. The mass of stone may be described as irregularly ovoid, and was probably originally a bowlder closely approximating the present general contour. The height is 9¼ inches, the depth from front to rear 9 inches, and the greatest thickness from side to side 6¼ inches. The entire surface, except the flattish rough-dressed base, is covered with carvings, the motives being the serpent in two phases—one supplementing the other—two human figures, and three independent devices probably symbolic or otherwise significant. These features are shown as completely as possible in the accompanying photographic views, Pl. LVI; a front view is given in *a*, and exhibits the open mouth of the serpent from which looks out a well-sculptured human face of mild and dignified mien, the physiognomy being that of a woman rather than that of

HEAD OF A DIVINITY, CARVED IN BLACK DIORITE. (ONE-HALF ACTUAL SIZE.)

a man. The reptilian features may be a little difficult to trace in the illustration, as they extend partially around the rounded margins of the stone. We may observe first the two curved lines representing the upper lip. These are arched over the human face, pass down the sides and curve outward terminating in coils at the corners of the mouth, while beneath these is the remarkable array of fangs forming, in appearance, a sort of crown to the human face. The lower lip or jaw is represented by three ridges over which hangs the forked tongue of the serpent terminating in two wide coils which reach to the lower margin of the stone. Two tusk-like fangs rise from the lower jaw at the sides of the tongue and rest against the cheeks of the human visage. Above, connecting with the lip lines, is the muzzle, with depressions for the nostrils at the sides; while below these at the right and left are the eyes, over which extend the broad coiled brows partially lost to sight around the margins of the stone.

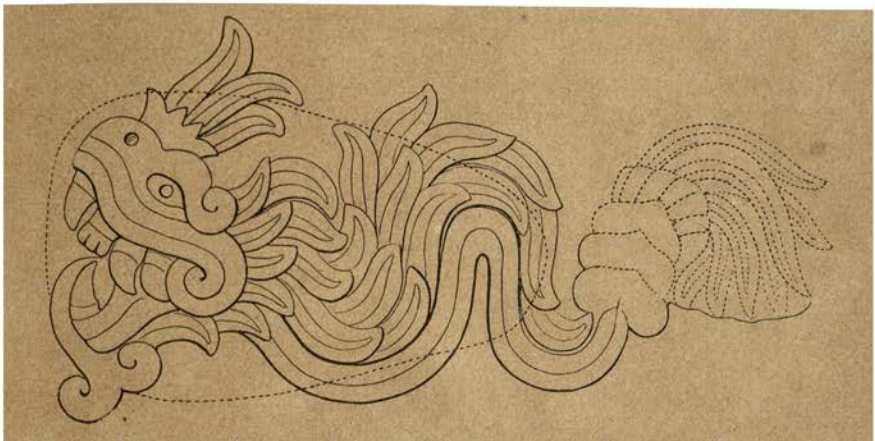


FIG. 121. FEATHERED SERPENT CARVED IN RELIEF ON THE UPPER AND BACK SURFACES OF THE SPECIMEN ILLUSTRATED IN PL. LVI.

The rattle and appended feathers are restored from suggestions of the partially preserved outline.

A second serpent head in profile is carved on the upper surface of the stone, the forked tongue hanging down over the right nostril of the front face. The features of this profile head are much the same as those of the other example; the jaw curves, the fangs, the eye with its brow coil, and the nostril are present, and in addition a crown-like plume rises from the front of the head. Connecting with the head are the gracefully sculptured feathers and the sinuous ventral lines of the body; these pass back over the narrow upper margin of the stone and down the back terminating below in the rattle, now unfortunately nearly all broken away. This serpent figure is shown in outline in Fig. 121.

Very striking features of this sculpture are two human figures occupying the sides of the stone, as shown in *b*, Pl. LVI. These figures are nearly or quite nude, and sit cross-legged with face in profile. Each is engaged in perforating an ear with a bone awl, and tears, in expression of pain, hang pendant on the cheek. One of the figures represents a woman, and the other, judging by the physiognomy, is that of a man.

There remain to be described only three small devices in relief. One is placed in front of and a little above the head of the figure illustrated in *c*, and consists of a circlet below joined to two coils above, suggesting a usual smoke symbol. The two other devices are almost exactly alike, and are placed one in front of each sitting figure as indicated in *b*. Each consists of a conical elevation divided into three segments by cross grooves, and two smaller conical forms—each divided by a single cross groove—extending in banner-like fashion from the vertical ridge as a staff.

The significance of this striking and handsome piece of sculpture is a subject for conjecture, though the principal motive embodied is one common to the native races of a large part of Mexico and Central America. The feathered serpent with the head or face of a human being appearing from the open mouth, is a familiar figure in the sculpture, painting and plastic art of the whole region.

CARVED SHELLS. Two examples of the highly artistic carved shell work of the ancient Mexicans are presented in Pl. LVII. This beautiful material was much prized by all the native tribes and was worked up into a great variety of personal ornaments, among which the gorget or breast-plate was the most striking form. The specimens illustrated are of a pale reddish hue, somewhat whitened on the surface by weathering, and were probably derived from some variety of conch shells. Both are perforated for suspension or attachment. The upper piece is drilled from the back, the hole opening out in the upper margin, and the lower specimen is pierced for attachment rather than for direct suspension, as indicated in the illustration. Both are well carved to represent winged human beings. The bodies are much abbreviated, and the faces are too large for good proportion. The arm and hand of the upper specimen are small and the legs are merely rounded projections. The wings are artistically treated; the two parts or lobes do not quite correspond and it is possible that they represent a compound wing like that of the butterfly rather than the wings of a bird. The head in the lower specimen is crowned by a large and quite elaborate head-dress of plumes, ties and tassels. The body and limbs are but slightly indicated, and a single wing extends back from the shoulders.

FEATHERED SERPENT AND OTHER SUBJECTS, SCULPTURED IN GREENSTONE. ONE-FOURTH ACTUAL SIZE.

CARVED SHELLS REPRESENTING WINGED HUMAN BEINGS. ACTUAL SIZE.

The origin of these objects is unknown. It was stated by a former owner that they came from southern Mexico, but this is doubtful. The style of treatment is new to me. The embodiment of the butterfly in various forms of art was common at San Juan Teotihuacan and it is not unlikely that the specimens belong in the Valley of Mexico.

Though evidently gorgets or breastplates, these specimens belong to a distinct class from the engraved gorgets found occasionally in Mexico, and distributed widely over our southern states. A specimen of the latter class, from Michoacan, belonging to the Abadiano collection, now preserved in the Walker Museum at the Chicago University, is of special interest because of its apparent close relationship with the gorgets of Missouri and Tennessee.* The analogies are especially noteworthy because of the great distance that separates the two regions, and because of the apparent absence of any corresponding forms of art in the vast districts that intervene. That the Ancient Tennesseeans used the discoid gorgets with engraved human figures and in large numbers is made apparent by the frequency with which they are found. In Michoacan only the one specimen has been reported, but the manner of delineating the human figure employed is typically Mexican, and, since the natives of the entire country wore similar discoid plates, plain or engraved with appropriate designs, there is no reason for regarding the Michoacan specimen as intrusive. The human figures used in these cases were doubtless of mythological origin and, associated with the wheel-like ornament, probably had some calendaric significance or use. Associated with a form of ornament common to all sections of North America and based on myths and usages common to many peoples, the use of these particular devices may readily have spread from the place of their origin to many distant regions, the forms meanwhile undergoing but slight change. Adopting this idea we would be relieved of the necessity of assuming long distance transfer of objects or the extended migration of peoples, although such exchanges and migrations would not be without precedent.

I began this brief review of the sculptures of the Mexican Plateau without intending to enter into a discussion of the symbolism embodied, and I close with a well-defined impression that such a discussion must necessarily prove, in the present state of our knowledge, wholly unsatisfactory.

If we were dealing with works certainly of Aztec origin we could, perhaps, reasonably expect to make some definite correlations of the

*Starr, Frederick. Proceedings of the Davenport Academy, Vol. VI, p. 17.

objects with the myths they illustrate, and even some of the individual deities represented might be named, for there exists a great body of literature bearing more or less directly upon the general subject. Few works are, however, definitely known to be Aztec, though numerous specimens found on the site of the ancient Tenochtitlan are generally regarded as belonging to that people. There are few if any sculptures that can be correlated with the descriptions and allusions of those who wrote of the days of the conquest and saw or knew of the objects as they were originally displayed or used. I doubt if there is a single specimen of ancient Mexican mythological sculpture in any of the museums of the world that can be given a particular native designation with perfect assurance that its application may not some day be challenged.

Notwithstanding this lack of definite correlation of the sculptures with their original names and symbolism, there is yet a vast deal that may be learned or inferred from a study of these Plateau remains. There are recognizable several schools of sculpture representing many nations whose mythologies must have embodied closely analogous groups of conceptions; prominent among these conceptions are the personified forces and elements of the natural world, constituting a numerous and varied pantheon of rulers of earth, air and sky, whose sculptured forms may often be recognized in a general way by the more or less graphic symbols associated with them.

FIELD COLUMBIAN MUSEUM.

ANTHROPOLOGICAL SERIES. VOLUME I.

ARCHEOLOGICAL STUDIES

AMONG THE ANCIENT

CITIES OF MEXICO

BY

WILLIAM H. HOLMES,

Curator, Department of Anthropology.

PART I, MONUMENTS OF YUCATAN.

PART II, MONUMENTS OF CHIAPAS, OAXACA AND THE VALLEY OF MEXICO.

CHICAGO, U. S. A.

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